Engineering and Mining Journal

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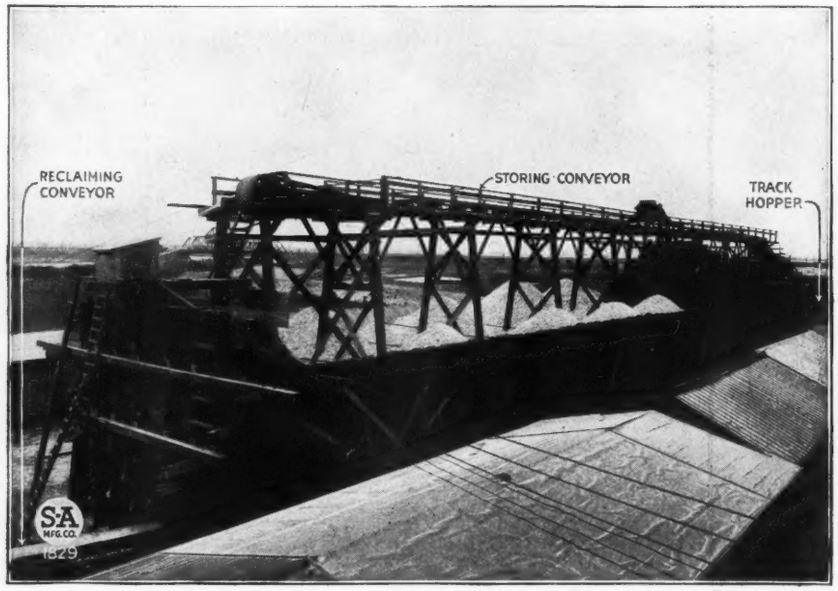

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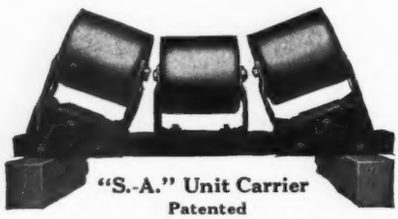

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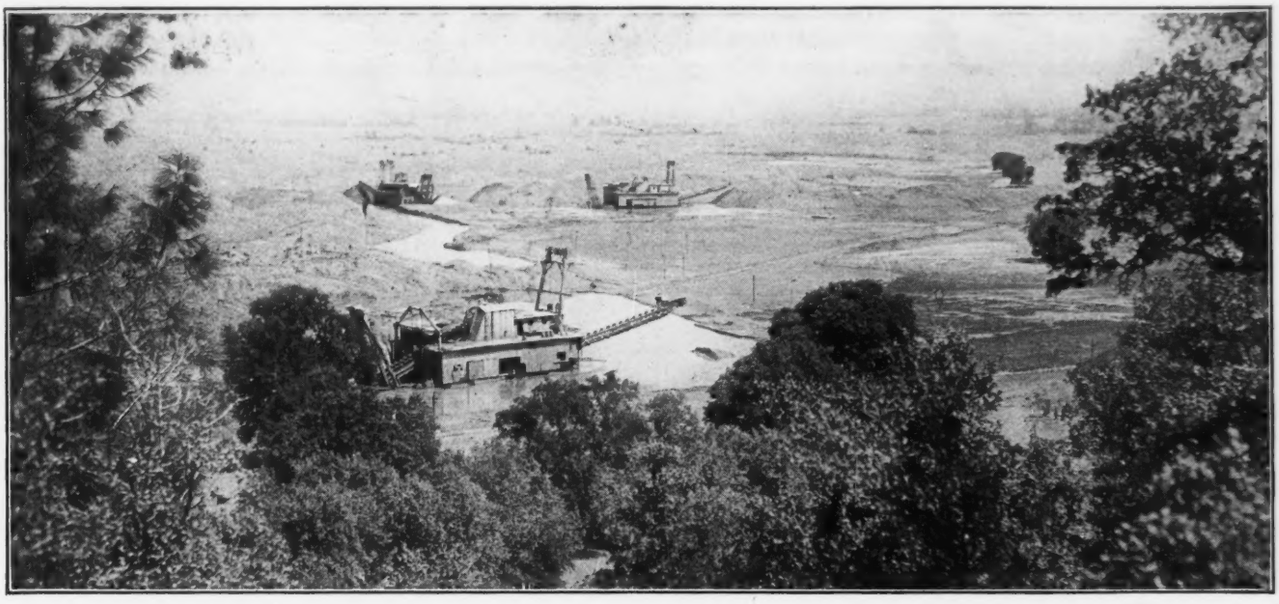


DREDGING FIELD AT OROVILLE, CALIF., WHERE REDREDGING HAS BEEN PRACTICED SUCCESSFULLY

Redredging—Will It Pay?

BY WALTER H. GARDNER*

Oroville Dredging, Ltd., has practically decided to redredge the ground formerly worked, near Oroville, Calif., by its Boston No. 1 dredge. It is believed that this can be made profitable with the use of the company's Boston No. 4 dredge, as the earlier types lacked equipment provided in modern dredges. Some previous attempts at redredging have been failures, although the Natomas Co., at Oroville, has succeeded in securing a large yardage at costs 40% less than those required for virgin operations.

OROVILLE Dredging, Ltd., will complete the operations now being carried on with its Boston No. 4 dredge early in 1918 and the question will then come up as to whether the management will scrap the dredge or continue its operation in tailings that have been deposited from former dredging operations. It is necessary to determine if there is sufficient gold remaining in the adjacent old workings to make redredging worth while.

A previous experience of this company was somewhat discouraging, although conditions were radically different from the plan now under consideration. From Jan. 19 to Apr. 7, 1910, California No. 2 dredged from one property to another through old tailings, but no attempt was made to dig to bedrock, the moving of the dredge being the only desideratum. The cost of transfering the dredge was $7900, and the gold recovered from the tailings handled amounted to only $360. But in this case every factor was in favor of a high recovery from the original operations. Boston No. 4, however, will be tried on an entirely different basis.

If the tailings are dredged, according to the plans practically decided upon by the company, Boston No. 4 will be reworking ground that was dredged a long while ago by Boston No. 1 dredge. Gold-saving devices then were far from modern. No quicksilver was used; the gold was caught on cocoa matting and the tables were cleaned up every day. The ground that was dredged was comparatively rich, running about 19c. per cu.yd. Boston No. 1 was a Risdon dredge, which lacked the efficient appliances now found on the up-to-date dredge. There is evidence that the dredge did not dig to bedrock in some places, therefore it is expected that the gold recovered will more than pay the cost of operation under the proposed plan.

Most of the California dredging companies have had some experience in redredging. Several years ago the El Oro Dredging Co., at Oroville, ran through an area of gravel and heavy clay. This clay probably had formed from the kaolinization of the gravel in place. The gold

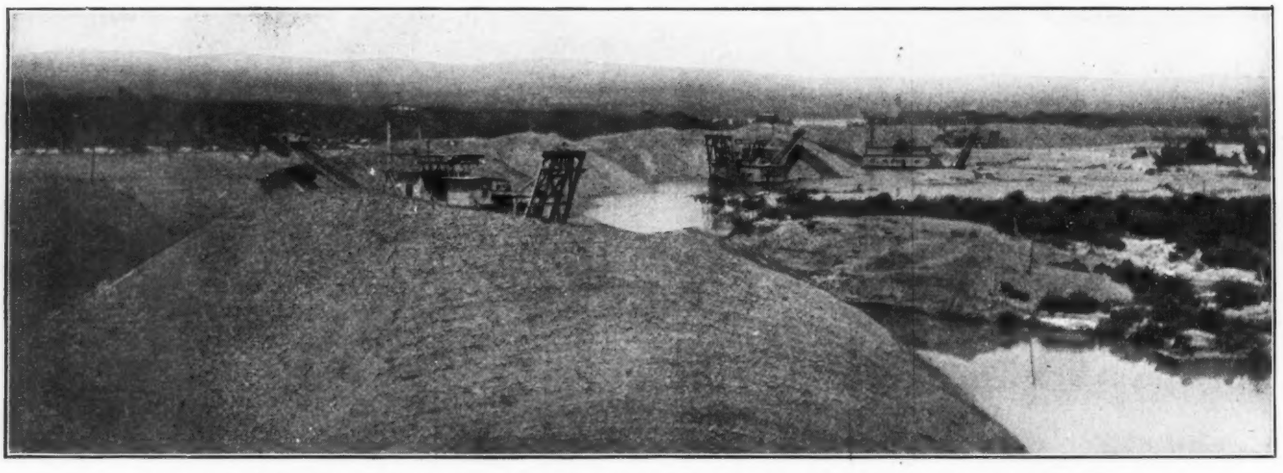
*1204 Oakland Ave., Piedmont, Calif.

recovered amounted to about 22c. per cu.yd., but the ground was extremely tough, so much so that sometimes the buckets would break an imbedded pebble in two rather than loosen it from the clay. The bank had to be shaved, as attempts to fill the buckets resulted in a lumpy material that passed through the screens, and even then the operators were doubtful as to whether they were breaking up this ground sufficiently to recover all of the gold. Seven years later the opportunity came to redredge the richest part of this ground. The remainder of the property had been worked out, and the old dredge was about to be abandoned near this particular spot. It was decided to continue the operations of the dredge and determine if the seven years of weathering had completed the disintegration of the clayey gravel. The following results were obtained for the first of the three months during which the dredge worked in the tailings: First block, original yield 12c. per cu.yd., redredged yield 3.1c.; second block, original yield 22c. per cu.yd., redredged yield 3.6c.; third block, original yield 26c. per cu.yd., redredged yield 2.1c. In all, 235,022 cu.yd. of tailings were handled. Under the operating conditions, the returns were less than the cost, so the dredge was finally dismantled. This experience would indicate the improbability of successful redredging in California. In this case, the original content was high and the first washing, to some extent, was incomplete. Of course this redredging is not conclusive proof that some of the gold does not remain in the ground. In fact, there is little data to show the efficiency of the modern dredge, as far as gold recovery is concerned.

Redredging Operations of Isabel Company Failed on Account of Clay Deposits Encountered

Some years ago the Isabel Dredging Co., of Jenny Lind, Calif., dug up ground that ran about 26c. per cu.yd. over a considerable acreage. Overlying 10 ft. of gravel was 10 ft. of clay, and this was covered by another 10 ft. of loam. The clay rendered dredging operations difficult and tended to "rob the tables" so that a good deal of quicksilver was lost. When the gold recovered from the tables was checked against the gold in the clay coming in in the buckets the results showed that the tables were saving only about 46% of the gold brought aboard. Therefore, when the opportunity came about a year ago to redredge, every indication pointed to a high yield. However, the recovery was only 2c. per yd. and the dredge ran only about three weeks in an attempt to save more than this. The failure of the redredging in this case was due to the fact that this particular clay did not disintegrate and was just as difficult to handle as

YUBA NO. 16 IN REDREDGING OPERATION AT HAMMONTON, CALIF.



EARLY CALIFORNIA DREDGES. REDREDGING MAY BE ATTEMPTED ON THIS PROPERTY

when first dredged. Those in charge of this dredge are of the opinion that, undoubtedly, the ground could be dredged over several times and approximately 2c. per yd. would be recovered each time. The same dredge is at present working in tailings of the old Calaveras property, but the results have not as yet been announced.

Natomas Company Redredging at a Profit

The only successful redredging on a large scale has been accomplished at Oroville, Calif., by Feather River No. 1 dredge of the Natomas Co., which has been digging in the tailings of the old Couch dredge, the pioneer in this territory. The Couch dredge had no save-all, was operating in a pond where spring freshets raised the water level so that the buckets could not reach bedrock, and dug by the old "chopping up and down method" while a modern dredge swings from side to side, the buckets revolving as it swings. The Couch dredge dug in one place while the ladder was slowly lowered, the buckets were then raised, the dredge was moved over 10 ft. and the operation repeated. This was soon found to be a wasteful and inefficient method. Feather River No. 1 has made good profit from redredging this old ground. No difficult digging has been encountered, yardages as high as 300,000 cu.yd. per month have been secured, and the cost of operation has been about 60% of what it would have been in virgin soil.

Redredging Not Usually Profitable If First Operation Is Thorough

Of the thousands of acres of dredge tailings in California, it is doubtful if any great percentage will ever be redredged at a profit. If the ground was properly dredged originally, it is safe to say that reworking will not be profitable. If, however, there is some gold remaining, redredging at a profit may be feasible, as in some deposits considerable gold may have been left in the ground, due to the following causes: (1) Antiquated or inefficient equipment may have failed to dig gravel to bedrock or recover gold. The cocoa-matting gold-saving devices of former days were not satisfactory. Some of the old dredges did not carry sufficient riffle area and some had no save-all. This latter is an important item, as instances are reported where save-alls, when installed, recovered sufficient additional gold to take care of the payroll of the dredge. (2) Where low gold recovery was made, excessive clay may have robbed the tables and prevented complete washing of the gravel. An inadequate water supply may give the same result. (3) There have been many instances where a digging ladder was not long enough to reach bedrock. This was true in some of the early workings of Yuba Consolidated Gold Fields. It was true in the instance of the Couch dredge, which floated in an open pond, subject to the rise and fall of the river, and during flood times a 25-ft. ladder could not reach bedrock. Before the double-cut system, which makes use of double-stackers, was generally adopted, the single-cut or single-stacker was used. This tended to leave windrows in the dredged ground. Other instances also are on record where operators, in an effort to procure a high yardage, failed to dig to bedrock. There were many other cases, also, where it was deemed inadvisable to take a last bedrock cut. Values were high, but it was impossible to get full buckets.

In conclusion, it may be said that redredging is not likely to prove profitable where the ground was thoroughly dredged in the first place. It must be remembered, however, that to apply a modern dredge into old tailings is to increase the yardage obtained and therefore decrease the cost of operation per cubic yard. Under the right conditions, many hundred thousand cubic yards of tailings may be reworked at a profit.

Adjustment of Miners' Wages on the Rand

The wages to be paid white mine workers on the Rand are stipulated in an agreement which has been made between the Rand Mine Workers' Union and the Transvaal Chamber of Commerce. The London *Financial Times* of Nov. 5 quotes the following details of the compact:

"It is to be distinctly understood that the rates of day's pay provided hereunder are minimum rates, below which no person employed on day's pay is to be paid, and that the establishment of these minimum rates shall in no way interfere with those who are already on day's pay, and in receipt of higher rates, or in any way prevent the payment of such higher rates in future. The gold mining companies, members of the Chamber, undertake: (1) Not to engage for underground work a man in any capacity, other than as a learner, at a rate of pay less than 12s. 6d. ($3) per shift, and not to pay less than this rate to any man who has had six months' experience underground on any mine or mines. (2) To pay at least 15s. ($3.60) per shift to any man employed on day's pay who has had 15 months' experience in any underground occupation in any mine or mines. (3) Not to employ any man on day's pay in any one of the occupations referred to in Group 1 at a rate of pay less than 20s. ($4.80) per shift who has been employed two years in any one or more of such occupations, or at a rate of pay less than 16s. 8d. ($4) per shift who has had 15 months' experience in underground work on any mine or mines, nine months of which have been in one or more of such occupations. (4) Not to employ any man on day's pay in any of the occupations referred to in Group 2 at a rate of pay less than 20s. ($4.80) per shift who has been employed two years in the particular occupation in which he is, or is engaged to be, employed, or at a rate of pay less than 16s. 8d. ($4) per shift who has been employed 15 months in underground work on any mine or mines, nine months of which have been in the particular occupation in which he is, or is engaged to be, employed.

"The following are the occupations referred to in Clauses (3) and (4) as above: Group 1, machinemen, hammermen and timbermen; Group 2, platelayers and pipemen, truck repairers, pump chargemen, masons or stonewallers (excluding waste packers), and ropemen. (5) That persons employed on day's pay as mechanics —namely, men qualified in any of the trades included in the definition of mechanics in the joint agreement between the representatives of the Chamber of Mines and the mine employees, dated July 26, 1915, who are actually required to practice such trade in any underground occupation—shall be paid not less than 22s. 6d. ($5.40) per shift. It should be noticed that in accordance with

the scheme outlined above such men as skipmen, trammers, sanitary men, etc., are guaranteed a minimum wage of not less than 15s. ($3.60) a shift after 15 months' underground on any mine or mines.

"The line of demarcation between the various classes of work comprising the different groups is fairly well defined, and, although the adoption of this scheme does not necessitate the introduction of a schedule setting forth the pay of each underground occupation, it is possible that such a schedule may eventually come into being, and for that reason it is considered to be most important that the mines adopt a uniform method of naming the various underground occupations so as to avoid the confusion which now arises.

Week of 48½ Hours Bank to Bank

"On the question of a 48½-hour week, bank to bank, the actual terms of the Chamber's offer are: As from Jan 1, 1918, the underground working week to be 48½ hours bank to bank; the length of each shift to be counted from the 'first skip down' to the 'first skip up,' the Saturday shift to be at least one hour shorter than the weekday shift, provided that the short shift shall not necessarily apply to developers and shaft sinkers if mutually arranged to the contrary between the mine management and the individual concerned, such mutual arrangement being, of course, subject in any case to the requirements of the existing law and of mining regulations. These proposed arrangements are subject to certain mines, not exceeding six in all, being exempted from the arrangements, and also to the union undertaking that it will not again raise the question of working hours until at least three months after the declaration of peace. 'In the case of Randfontein, the present 48 hours per week bank to bank would, of course, still remain in force, but the Saturday shift would be shortened and the weekday shift correspondingly lengthened.' These terms were also accepted. With regard to the employment of colored labor, the Chamber undertakes to maintain the *status quo.*

Temporary War Bonus Provided

"The additional war bonus offered as from Sept. 1 is an extra 10s. ($2.40) per month for each 'total dependent'—wives and children only coming under this heading. The offer is that this additional bonus shall be applicable to all employees earning up to and including £30 ($146) per month. Between £30 and £32 10s. ($158.13) per month a similar bonus, but at 7s. 6d. ($1.80) per dependent, would be given; and between £32 10s. ($158.13) and £35 ($170.33) per month, 5s. ($1.20) per dependent. It will be observed that the additional bonus, like the present bonus, does not apply to single men without dependents. The Chamber looks upon the war bonus entirely as a temporary measure to meet special conditions arising through the increase in the cost of living due to the war. On the question of an additional allowance to single men with dependents, the variety of dependency is so great that the Chamber prefers that each case should be treated on its merits by the mine concerned, as far as possible on similar lines to the above additional scale, it to be open to any individual who considers he has been unfairly treated to bring the matter to the notice of the Chamber for inquiry. The war bonus was also accepted."

Work of Bureau of Standards

Since the war began, all branches of the U. S. Bureau of Standards have been conducting researches on technical problems of military application. Routine activities, however, have not been overlooked. The chemical investigations of the Bureau included the development of new methods of analyzing steel and other materials; study of platinum purity; coöperation upon military researches involving chemistry, such as the preparation of special gases and combustion gas detectors, and chemical researches and materials testing in great variety and quantity for the Government. Technologic achievement comprised a wide range of researches into the special technologies of the metals, cement, clay, clay products, lime, stucco, paints, roofing materials, and miscellaneous materials, such as paper, textiles, rubber, leather, glass and the like. The results are published by the Bureau in a series of about 20 technologic papers issued from time to time during the year.

The standardization work has comprised the making of 155,000 tests of weights, measures, measuring instruments, and materials; promulgation of a new standard screen scale for unifying the sizes of industrial sieves; establishing a new gage standard laboratory for testing munitions gages; standardization of master scales in 21 states and of the master scales of the American Railway Association; extension of the work on altitude measuring instruments to include all varieties of aviation instruments, and a large number of special researches in physics of materials.

The report describes much interesting work on standards for electrical measurements, radio researches, practical tests of the Bureau's radio fog-signaling system, radio direction finder, magnetic system of testing steels to ascertain quality for tool making, rail making, ball bearings, and the like; standardization of radium and radio-active preparations, including radium luminous paints for watch dials and the dials of aviation instruments; inauguration of the work on X-ray standardization, improved methods of light measurement, and the important work of safeguarding underground structures from the damage caused by stray electric currents.

The optical work of the Bureau is of special interest and includes the precise measurement of wave lengths of various colors for use as standards in optometry; red and infra-red photography as applied to the photography of the spectra of laboratory materials, and of the stars and the sun; optical methods of finding impurities in materials; standardization of optical apparatus such as camera lenses, field glasses, range finders and similar equipment, and analysis of radiation with respect to energy distribution. The regular growth of the Bureau and its special expansion on account of war demands have resulted in the construction of several new laboratories and a 60% increase in the staff.

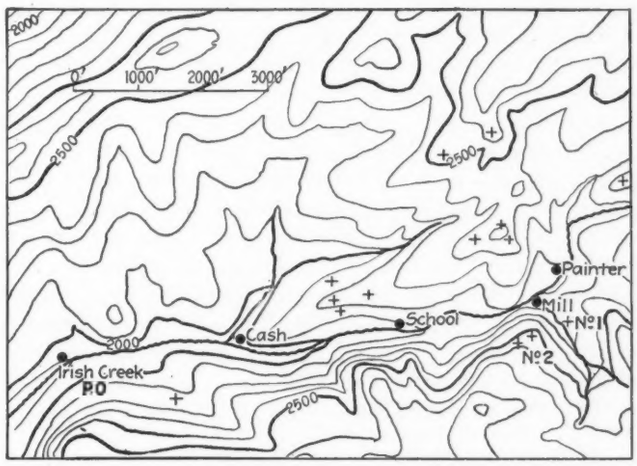
Manganiferous Iron Ore Shipments from mines near Silver City, N. M., have totaled over 31,000 tons since April, 1916, according to *Iron Trade Review.* The ore averages 16% manganese, 35% iron, 6% silica and 0.012% phosphorus and has been sent to the Colorado Fuel and Iron Co. at Pueblo, Colo., for conversion into spiegeleisen.

Tin Deposits of Irish Creek, Virginia*

By HENRY G. FERGUSON†

Cassiterite from Rockbridge County, Virginia, was first identified in 1846. Between 1882 and 1893 several haphazard attempts were made to mine the tin lodes of Irish Creek. Though the oreshoots worked in the past were not large, there is some hope that systematic development might be rewarded. Little erosion of the tin veins has occurred and no placers of commercial size exist in this section.

CASSITERITE from Irish Creek, Rockbridge County, Virginia, was identified as early as 1846, but the discovery seems to have been forgotten and no attempt at mining was made until the occurrence was rediscovered in 1882. Between 1882 and 1893 several attempts at mining were made and one company built an expensive mill. The work was apparently conducted in a haphazard manner and litigation over titles added to the difficulties of mining. The only tin produced was a small amount smelted in blacksmiths' forges from the high-grade ore and a little from the concentrates produced during experimental runs of the mill. As far as known no work other than a little prospecting has been done since 1893.



SKETCH MAPS SHOWING TIN DEPOSITS OF IRISH CREEK, VIRGINIA

The district lies in an isolated portion of the state, just west of the summit of the Blue Ridge. The old mine may be reached either from Arrington, on the Southern Ry., a drive of 29 miles, or from Vesuvius, on the Norfolk & Western Ry., 12 miles by road. The country around the head of Irish Creek is hilly, but the relief is not so great as in the valleys to the north and south. According to Winslow,[1] tin-bearing veins have been discovered at various point northward from James River Gap as far as the northern boundary of Rockbridge County, but it is only around the headwaters of Irish Creek that development work has been done.

The tin-bearing veins occur in a granitic rock of peculiar type which outcrops around the headwaters of Irish Creek. The rock consists essentially of orthoclase, quartz, andesine and hypersthene, with minor amounts of hornblende, titanite, apatite and, rarely, biotite. It may be termed a hypersthene granodiorite. Except for a greater amount of quartz, it appears to be essentially similar to the rock occurring in large amounts elsewhere along the Blue Ridge, called akerite by Watson.

The hypersthene granodiorite occupies a considerable area along the crest of the Blue Ridge and to the eastward. East of the divide, however, its appearance is greatly altered, due to replacement of the ferromagnesian minerals and a part of the feldspar, particularly the plagioclase, by epidote, giving the rock called unakite. The age of the rock is probably pre-Cambrian, although no direct evidence was obtainable in the area.

A normal granite consisting of quartz, orthoclase, and biotite was found in places between one and two miles west of the tin deposits, but does not appear to occur over a large area. The other rocks of the Irish Creek area are chiefly granitic gneisses, commonly consisting chiefly of quartz and orthoclase, with varying amounts of ferromagnesian minerals, of which biotite and hornblende are the most prominent. It is assumed that since the gneissic structure is lacking in the granodiorite, it is younger than the gneiss. Dikes of nelsonite, a fine-grained rock consisting of ilmenite and apatite, were observed in several places. Small aplite dikes were found near the cassiterite veins. These showed essential quartz and orthoclase, with muscovite and fluorite as accessories.

Cambrian sediments occur along the steep ridge northwest of the upper reach of Irish Creek. It is probable that along this ridge the contact with the granodiorite and associated rocks follows a fault plane. About two miles southwest of Irish Creek post office, however, the sediments appear on the banks of Irish Creek apparently overlying the older crystallines. Small irregular areas of sediments, which appear to have been preserved by folding, were also encountered south of the headwaters of Irish Creek. Small dikes of diabase

*Published by permission of the director of the U. S. Geological Survey.

†U. S. Geological Survey, Washington, D. C.

[1]Winslow, A., "Tin Ore in Virginia," "Eng. and Min. Journ.," Vol. 40, p. 320 (1885).

occur throughout the region. These are in all probability later than the other rocks of the area and appear to cut the cassiterite-bearing quartz veins.

The veins were found only in a limited area near the head of Irish Creek, about two miles west of the crest of the Blue Ridge. All the old workings are caved and for the most part the veins are covered. The principal mineral is quartz, slightly bluish in color and dense and glassy in appearance. Cassiterite as a rule occurs along one or both walls of the vein, usually in fairly large crystalline masses and also in extremely small grains in the altered wall rock adjacent to the veins. In the course of the old mining operations large vugs lined with cassiterite crystals were found in a few places. The color is brown or gray. Rusty brown siderite is in places a common vein mineral, and like the cassiterite follows closely the walls of the vein. At first sight it is easily mistaken for cassiterite, owing to the resemblance in color and occurrence. The cleavage is, however, distinctive. In part the siderite is found altered to porous limonite.

Massive arsenopyrite and pyrite were found on one of the old dumps, and small grains of pyrite occur sparingly in the altered wall rock of some of the veins.

Numerous Other Minerals Besides Cassiterite

Assays of the arsenopyrite quoted by Hotchkiss[2] show a content of 38 oz. silver and 0.1 oz. gold per ton. Wolframite, together with a little scheelite, has been found in the old workings south of the mill. An assay of concentrates consisting chiefly of siderite, pyrite, ilmenite, and cassiterite, showed 0.42% WO_3. Other minerals present are beryl, fluorite, and muscovite. Beryl in long slender crystals was found as an important constituent of one small quartz vein and also occurs in microscopic grains in the altered wall rock at one locality. Fluorite is an important constituent of the altered wall rock close to the veins, but was not found in the veins themselves, though it also occurs as an apparently original constituent of the small aplite dikes in the vicinity of the veins. It is commonly colorless or white and only rarely shows a faint purple tinge. Muscovite, a rare constituent of the veins themselves and usually found close to the walls, is the most important mineral in the altered wall rock.

The veins are everywhere accompanied by a peculiar greisen-like alteration product consisting essentially of muscovite and fluorite with minor amounts of beryl, siderite, cassiterite, quartz and ilmenite. This quartz is for the most part a residual from the unaltered granodiorite, although close to the veins secondary silicification has taken place. The ilmenite is also residual from the granodiorite. This altered zone varies in width from a few inches to several feet.

Old Workings by Opencut, Tunnels and Shafts

As far as can be judged from the old prospects, the veins are not continuous over long distances, nor are the widths at all constant; and, according to local information, the amount of cassiterite present varies greatly within short distances. Most of the early work seems to have been done on the veins which outcrop on the hill south of the mill, known as the No. 2 workings. There are several small opencuts, two caved tunnels, probably of considerable extent, and one shaft, said to have reached a depth of 60 ft. Two quartz veins outcrop about 40 ft. southwest of the shaft. These show a width of 5 and 10 ft. of white quartz and are separated by about 5 ft. of altered granite. The strike is N 50° E and the dip is 60° SE. A parallel vein outcrops about 30 ft. to the southeast, and a few fragments of quartz containing large crystals of cassiterite and several pieces of nearly pure cassiterite were found here.

Vein in No. 1 Workings Dipped Steeply to the South

The No. 1 workings are near the bed of the south fork of Irish Creek, about 500 ft. southeast of the mill. Here the principal vein has a strike of N 87° W and dips steeply to the south. It has been followed by tunnel and opencut for a distance of about 200 ft. eastward from the stream. The old workings have a maximum width of 12 ft. This, however, undoubtedly includes both vein and altered granite. At the eastern end of the workings the vein has a width of from 1 to 3 in., with a band of altered granite on either side. A little cassiterite is present in the quartz close to the walls of the vein and microscopic grains of cassiterite occur in the altered wall rock. According to local report, the workings followed a streak of nearly pure cassiterite along the hanging wall. This varies from a knife edge to about 2 in. in thickness, with occasional larger pockets in which large crystals of cassiterite were found in vugs. About 100 ft. north of this vein a small opencut exposes a 3-in. quartz vein carrying a considerable amount of beryl in long slender crystals and small plates of muscovite. The granodiorite adjoining the vein is intensely altered, but here the alteration consists of replacement of the original rock by an aggregate of muscovite and beryl, rather than muscovite and fluorite, as in the other veins. No cassiterite was found in this vein.

The other prospects seen in the district are too badly caved to afford evidence as to the size or direction of the veins. The veins which outcrop on the ridge north of the schoolhouse and the hills north of Painter's house show fragments of altered granite and quartz on the dumps, but no indication of valuable mineralization was found in the others.

Average Grade of Ore About One Per Cent.

Older reports on the district contain large numbers of assays, many showing high percentages of tin, but for the most part are too indefinite to be of much value in determining the grade of ore. Hotchkiss[3] gives the results of a large number of assays showing a tin content of from 0.1 to 13.79%. The report by Winslow,[4] gives assays from two veins showing a tin content of from 0.63 to 1.12%. Benedict[5] gives the following record of test runs of the mill: 90 tons assaying 3.44% Sn gave concentrates assaying 43.44%; 75 tons assaying 3.28% Sn gave concentrates assaying 40.40%; 125 tons assaying 3.26% Sn gave concentrates assaying 45.07%.

None of the veins was sufficiently well exposed for sampling at the time of my visit, but samples were taken of the material, chiefly altered granodiorite with minor amounts of quartz, in the ore bin of the mill; from a pile of crushed ore left on one of the vanners,

[2]Hotchkiss, J., "Silver and Gold in Virginia Tin Belt;" "The Virginias," Vol. 4, p. 168 (1883).

[3]"Mineral Resources," 1885, pp. 372-375.
[4]Loc. Cit., p. 320.
[5]"Mineral Industry," 1892, Vol. I, p. 455.

and from a heap of coarse concentrates on the floor of the mill. These last showed much siderite and ilmenite, easily removable with an electromagnet. together with a large proportion of quartz, muscovite and fluorite, which might have been removed by better gravity concentration. These samples were assayed by Ledoux & Co. with the following results: Material from ore bin, 0.30% Sn; WO_3, none. Material from vanner, 0.21% Sn; WO_3, none. Concentrates, 15.80% Sn; WO_3, 0.42%.

The discrepancy in tenor of the ore as shown by these assays, compared with the assays quoted above, may perhaps be accounted for by assuming that the mill runs quoted by Benedict were made on selected ore and that in the final stages of operation an attempt was made to run low-grade material in order to show a large tonnage. Moreover, according to local information, the pieces of ore showing visible cassiterite were not milled, but picked and broken by hand. It is probable that the assay returns given by Winslow most closely approximate the true tin content of the veins.

Little Possibility of Tin Placers

The stream sands of Irish Creek and neighboring streams were panned in order to determine whether possibilities for placer mining existed. The concentrates consist chiefly of ilmenite, with minor amounts of epidote and other minerals as yet undetermined. In several samples a few grains of cassiterite were present, but nowhere in sufficient amount to give indication of workable placers. From the fact that small patches of the sediments were found in the neighborhood of the tin deposits, it is believed that the tin-bearing veins themselves have been but slightly eroded since Cambrian times, and consequently only a comparatively small amount of cassiterate has been released.

In conclusion it may be said that the district offers some hope of reward for systematic development of the discovered veins and a possibility that prospecting conducted in the area of hypersthene granodiorite along the Blue Ridge in this vicinity may uncover other deposits. The best indication of a possible tin deposit appears to be the presence of the muscovite greisen-like alteration product of the granite. As far as observed, this alteration everywhere accompanies the tin-bearing veins, and where float of fragments of muscovite-fluorite rock is found on the hillsides it should be followed up carefully. Panning of the soil of the hillsides may also lead to new discoveries. It seems probable that areas in which the granodiorite has suffered extensive epidotization will be found less favorable than regions in which the rock is unaltered.

Tin Deposits of the Carolinas

The presence of cassiterite at many places in the Kings Mountain district of North and South Carolina has led to prospecting and attempts at mining, according to a report[1] issued recently by the U. S. Geological Survey on the tin resources of that district. In at least one place—the Ross mine, near Gaffney, S. C.—placer mining was temporarily profitable. Most of the work on the lodes, pegmatite dikes carrying cassiterite, was done at a loss, but the results are not conclusive.

[1]Bull. 660-D, U. S. Geol. Surv., Washington, D. C.

Engineers' Combat Wagon

Each engineer regiment in the United States Army has two tool wagons, or combat wagons, which contain all the equipment for the pioneer work of the company. The pioneers are distinguished from the pontoniers; the latter have a bridge train with canvas pontons. The pioneers do the digging, building, repairing, surveying, mapping, etc., and the engineer tool wagon contains all the tools. It is a joy and a marvel to the lay engineer that it can carry so many different tools and so many of each, not to mention a camera and complete developing and printing equipment, and a complete surveying, map-making and zinc-o-graph map-reproducing outfit, so that a survey completed at sundown can be mapped and everybody concerned have a copy of the map by morning. Saws, hammers, shovels, caps, fuse and dynamite all in one wagon is contrary to the decalogue of the mining engineer, but is justified by military necessity, and they are so disposed, the caps in a padded compartment, etc., that, as a matter of fact, no accidents occur.

The combat wagon is a wonder, and when its contents are spread on the ground for inspection or inventory it seems impossible that they ever came out of it or would ever go back. The illustration shows a combat wagon of B Company, 22nd New York Engineers, at McAllen, Texas, last year. A loaded tool wagon weighs 4700 to 5100 lb. and is drawn by four army mules. The following is a list of the contents of two combat wagons, one half the quantity being carried in each. It is taken from the "Addenda" to Engineer Field Manual, Professional Paper 29, Corps of Engineers, U. S. A.:

ARMY ENGINEERS' COMBAT WAGON OPENED FOR INSPECTION

LOADINGS OF ENGINEER COMPANY TOOL WAGONS

One-Half of Quantities Given Below Carried on Each Wagon

Carpenter equipment:	
Chest, carpenter's, containing augers, ship, handled (3); scratch awl; ax, handled, 32-in. (with extra handle); ratchet brace, and bits (2 auger, 1 expansion, 2 screwdriver); chisels, framing, handled (3), (one extra handle); cold chisel; wing dividers; draw knife; files, saw, taper (3); hammer, claw (with extra handle); ratchets (5); 24-in. carpenter's level; mallet; oiler, ½-pt.; oilstone; jack-plane; pliers; plumb bob; rules, 2-ft. (4); saws, hand rip (1), crosscut (2), compass (1)]; saw set; screwdriver; squares, steel, carpenter's (1), try (1); tape, metallic, 50-ft.; T bevel, and wrenches, monkey, 12-in., sets	2
Carpenter's supplies:	
Chalk, carpenter's, lb	½

Chalk lines, 40-ft	4
Pencils, carpenter's, doz	1
Demolition equipment:	
Augers, earth, handled, and ship, handled, 1⅛-in.; bars, pinch, large, and wood, tamping; cold chisel; single bit drills, long and short; miner's spoon, long (one of each), set	2
Box, cap	2
Box, match	2
Circuit detectors	2
Crimpers	2
Hammers, sledge, 8-lb	4
Magneto exploders	2
Pick mattocks, E. D. pattern, "intrenching," handled	4
Shovels, E. D. pattern, "intrenching"	8
Spoons, miner's, long	2
Wire, firing, double-lead No. 14, on reel, ft	2,000
Demolition supplies:	
Caps, detonating	100
Explosive, lb	200
Fuse, Bickford, ft	200
Fuse, instantaneous, ft	200
Fuses, electric	200
Matches, safety, boxes, doz	1
Tape, insulating, rolls	2
Twine, hemp, 2-oz. balls	2
Drafting equipment:	
Boards, drawing, 23 x 31 in. (with trestles)	2
And the following equipment: Field drawing instruments (set); steel eraser; erasing shield; map measure; protractors, G. S., semicircular, 6-in.; scales, 12-in.; architect's (1) and engineer's (1); triangles, 30-60 deg. and 45 deg., and T squares, 24-in., set	
Lamp, acetylene	2
Tubes, tin	2
	6
Drafting supplies:	
Books, note	6
Carbide, in 10-lb. cans, lb	40
Cloth, tracing, 30-in., roll, yd	48
Erasers, rubber, pencil (2), ink (1)	6
Ink, drawing, black (2), blue (1), carmine (1), bottles	8
Ink, india, stick	2
Pencil-pointing pad, 1½ x 4 in.; scratch pad, 6 x 9 in. (2); blotting paper, 3¾ x 9½ in., doz. (1); pins; adhesive tape (2 rolls) and twine (2-oz. ball), set	2
Drawing paper, 22 x 30 in., sheets	288
Pencils, H and 3H (of each)	12
Pens, crow-quill and mapping, with holder (of each)	24
Thumb tacks	24
Hectograph equipment:	
Hectographs, clay, 20 x 24 in	2
Levelers, hectograph	2
Sponges	2
Hectograph supplies:	
Ink, green (1), red (1), violet (2), bottles	8
Paper, book, 19 x 24 in., quires	10
Miscellaneous equipment:	
Bags for nails, two 50-lb., one 100-lb	6
Buckets, galvanized-iron	6
Cans, galvanized-iron, 5-gal	2
Carborundum wheels	2
Handles, ship-auger (1), sledge (1), hatchet (3), pick-mattock (6)	22
Lanterns, dark (3), Dietz (6)	18
Manuals, Engineer Field (12), Ponton (1)	26
Marlinspikes	2
Padlocks, brass	12
Stamps, steel, sets	2
Stencils, sets	2
Miscellaneous supplies:	
Canvas, 10-oz., width 36-in., yds	20
Grease, axle, lb	10
Marline, lb	36
Nails, 60-penny (100 lb.), 30-penny (50 lb.), 16-penny (50 lb.)	400
Oil, signal, gals	10
Oil, machine, qt	2
Staples, lb	20
Screws, assorted, gross	6
Wicks, extra, dark lantern (6), Dietz (12)	36
Wire, B. & S. No. 16, lb	50
Photographic equipment:	
Camera, 3A kodak	1
Tripod, metal, folding	1
And the following accessories: Rubber blankets (2); canvas buckets (2); bulb, rubber; printing frames, 5 x 7 in. (2); graduate, 8 oz.; ruby lamp; Photographer's Manual; stirring rods (2); shears, 8 in.; film tank, 3¼ in.; thermometer; towels, bath (4) and agate trays (4), set	1
Photographic supplies:	
Albums for 3A films, size 3¼ x 5½ in	1
Books, photo note	1
Developer, M. Q. and Pyro, 8 boxes each, boxes	16
Films, 3A size, 6 exposures, size 3¼ x 5½ in	24
Hypo acid, in ¼-lb. boxes, boxes	24
Paper, 3A developing, size 3¼ x 5½ in. (1 gross), printing out (1 gross), gross	2
And the following articles: Potassium bicarbonate, 1 lb.; twine, ball (2 oz.); cheesecloth, white, 3 yd.; photo clips (12); formalin, 1 lb.; intensifier, tube (1); pushpins (12); potassium bromide tabloid tube (1); reducer tube (1) and wicks, ruby lamp (6), set	1
Pioneer equipment:	
Adzes, handled, 32 in	4
Axes, handled, 36-in	26
Bars, pinch, large	2
Blocks, 8-in., double; 8-in., single; 8-in., snatch; and 8-in., triple	8
Bolts, clippers	6
Climbers, lineman's, set	2
Comealongs	4
Files, crosscut saw	6
Hammers, sledge, handled, 8-lb	4
Handles, extra, adz, 32-in.; ax, 36-in.; pick, railroad, 36-in.; saw, crosscut, 1-man; and saw, crosscut, 2-man	14
Hatchets	6
Knives, Gabion	18
Machetes, with sheaths	36
Mauls, wood	4
Peevies, handled	4
Picks, railroad, handled	6
Pick mattocks:	
E. D. pattern, "intrenching," handled	30
Large, handled	6
Pliers, side-cutting	18
Points, pike and hook	4
Posthole diggers	2
Rope, manila, 1-in. diameter, ft	500
Saw, crosscut, 1-man	2
Saw, crosscut, 2-man	4
Saw, hack (with 6 blades)	2
Saw tools	2
Shovels, E. D. pattern, "intrenching"	60
Shovels, long-handled	12
Tapes, metallic, 50-ft	4
Wedges, steel, 5-lb	4
Wrenches, monkey, 18-in	2
Wrenches, Stillson, 18-in	2
Pioneer supplies:	
Bolts, drift, ¾-in. (40), ⅞-in. (40)	160
Lashings, manila, ¾-in. diameter, 50-ft. (12), ½-in. diameter, 18-ft. (25)	74
Sandbags, with binders	500
Tape, tracing, ft	3,000
Reconnaissance equipment:	
Chests, sketching outfit, each containing sketching board, with alidade, and folding tripod; service clinometer; timing pad holder; pencil pocket; rectangular protractor and pace tally	6
The following additional equipment:	
Barometer, aneroid, with cases	4
Clinometer, service, with cases	8
Compasses, box (2), prismatic, with cases (2), watch (6)	20
Field glasses, with cases	2
Odometers, with cases	2
Pace tallies	8
Protractors, rectangular	2
Sextants, pocket	2
Reconnaissance supplies:	
Books, note, field	32
Celluloid sheets	72
Erasers, rubber, pencil	28
Pads, timing	36
Paper, sketching, sheets, gross	3
Pencils, blue (14), drawing, H (42), green (14), red (14)	168
Protectors, pencil-point	28
Tape, adhesive, rolls	12
Company tool wagon parts, extra (furnished by the Engineer Department):	
Bolts, king, 1 x 18 in. (1); tire, ⅛ x 2½ in. (1), and ⅛ x 3 in. (5); square head, ⅜ x 2½ in. (2); carriage, ⅜ and ½ x 4 in. (2), and ½ x 2 and 3½ in. (4); carriage, 5/16 x 3½ in. (2), set	2
Links, open	6
Nuts, axle (one R. H. and one L. H.)	4
Reach, tongue, singletree, extra (of each)	2
Rivets, iron 5/16 x 2½ in. (6) and ⅛ x 2¼ in. (4)	20
Wrenches, axle	2
Company tool wagon accessories (furnished by the Quartermaster Corps):	
Nose bags, halters, and straps (of each)	8
Currycomb and horse brush (of each)	2
Grease, axle, lb	8
Whips	2
Harness parts, extra (furnished by the Quartermaster Corps):	
Buckles, ¾, ⅞, 1, and 2-in	8
Clips, trace	4
Hames	4
Rings, ¾, 1, 1½, and 2-in	8
Snaps, 1, 1¼, and 2-in	6
Straps, hame	6
Harness accessories (furnished by the Quartermaster Corps):	
Oil, neat's-foot, gal	1
Soap, harness, lb	2
Sponges	2
Wire, stove, spool	2
Additional supplies (furnished by the Quartermaster Corps):	
Mule shoes, fitted, and 10 nails	32

Mineral Output of Western Australia

The mineral production of Western Australia in 1916 has been officially reported as follows, the items being given in long tons, except when otherwise stated, and in order of descending value: Gold, 1,061,398 fine oz.; coal, 301,526; pig lead, 3523; copper ingot, matte, etc., 457; tin, 463; silver, 173,012 fine oz.; copper ore, 650; lead and silver-lead ore, 428; tantalite, 47; pyritic ore, 4409; zinc, spelter, etc., 14; antimony, 27; scheelite, 438; magnesite, 12. The total value of the mineral output for 1916 was £4,893,417, or £584,732 less than that of the previous year.

Tungsten and Molybdenum Ores may not be dealt in or offered for sale in Great Britain except by permit from the Minister of Munitions. This order became effective Nov. 30. The Minister of Munitions will also fix maximum prices at which such ores may be bought or sold.

Disadvantages of Chrome Brick for Copper-Refining Furnaces*

The following notes are presented in an endeavor to point out the disadvantages attending the use of chrome brick in reverberatory furnaces used in the treatment of materials that are too valuable to allow any great amount of metal absorption by the brick.

Several years ago one of the large Eastern copper refineries decided to utilize basic in place of siliceous material in the walls of its reverberatory furnaces for the treatment of very foul blister copper, as the latter rapidly corroded the siliceous linings. It was also expected that there would be less slag formation, with a consequent decrease in the cost of treatment and a reduction in the metal losses.

Spalling and Cracking of Magnesite Induced Trial of Chrome Brick

Magnesite brick were first used, but while the corrosive action of the foul material was greatly reduced, and the amount of slag formed was much less, the magnesite proved to be unsatisfactory in certain parts of the furnace, because of its tendency to crack and spall badly when subjected to the alternate heating and cooling that takes place in a reverberatory-refining furnace. This made many repairs necessary, and consequent frequent interruption in the operation of the furnace, which, together with the high price of the magnesite brick, ran up the cost of maintenance to an unreasonable amount.

It was, therefore, decided to substitute chrome brick for magnesite brick in the parts of the furnace affected. The results, as far as the reverberatory furnace was concerned, were satisfactory. The corrosion due to the action of the foul blister was small and the amount of slag formed was no greater than when using magnesite, and the tendency to crack and spall shown by the magnesite was eliminated. Gradually the use of chrome brick was extended to all furnaces, those treating blister copper as well as those melting cathodes, and the results were so satisfactory that the siliceous roofs were replaced by roofs of chrome brick except in certain places where experience showed a more satisfactory performance on the part of the silica brick. It was immediately recognized, both for the magnesite and chrome brick, that the metal absorption was heavy, but it was felt that the longer life of the furnaces and the decreased cost of slag treatment and metal losses would more than offset this disadvantage.

Difficult To Dispose of Chrome-Brick Cobbing

When repairs had to be made to the furnaces, the resulting cobbing was sent to the blast furnaces for the recovery of the copper, silver and gold contents. It was, of course, realized that chrome was a neutral material and could not be fluxed, but it was thought that, at the blast-furnace temperature, the cobbing would be melted, releasing the locked-up values and causing the chromium oxide to pass out mixed with the blast-furnace slag. For a time this method appeared to be satisfactory, but as more of the cobbing was made and treated in the blast furnaces, trouble developed. The capacity of the settlers began to be seriously reduced and slag losses increased, due to improper settling. On investigation, it was found that there had formed in the settler, between the matte and the regular slag, a layer of thick, mushy slag which was causing the trouble.

This mushy slag could not be fluxed, could not be tapped out with the matte, and would not of itself overflow through the slag spout. The only way it could be removed from the settler, without shutting down and digging it out, was to insert a pipe into the layer and by the use of compressed air cause it to mix and overflow with the regular slag. While this procedure cleaned out the settler, it also resulted in metal losses that could not be tolerated. Samples of this mushy slag showed it to contain as high as 25% chromium oxide, indicating that the cause was in the chrome cobbing added to the charge. Upon discontinuing the treatment of the cobbing, the settler trouble disappeared. The natural result of this was to accumulate a considerable stock of the chrome cobbing, and experiments were undertaken to devise a satisfactory process for the removal of the values that would leave a residue that could be sent to the dump.

Both Smelting and Wet Concentration Tried

The cobbing was crushed fine, thereby releasing the larger metallic particles, and treated in a reverberatory furnace with roasted pyritic ore and silica. This treatment gave a fairly fluid slag in which the chromium was apparently soluble. A considerable amount of the copper was thus recovered, but the slag was still too rich in copper to throw away, and when sent to the blast furnaces induced a return of the former settler troubles. Fine crushing and fusion with low-grade matte were expected to remove the copper and leave a slag sufficiently low in copper to be discarded: The results were unsatisfactory, for though the matte absorbed much of the values, yet the slag was thick and pasty and contained considerable copper.

It was felt that crushing followed by mechanical concentration might result in separating the metal from the brick. Accordingly, the material was crushed and screened to remove the coarse metallics and was then treated on a Wilfley table. There was sizing, but little concentration, as it was found that the entire structure of the brick was saturated with finely divided copper and copper oxide. Flotation was also tried without success, as the concentrate was too rich in chromium and there was too much metal in the residue.

Grind and Remove Larger Metallic Particles and Reconvert Cobs into Bricks

The most satisfactory solution yet found for the disposal of this material is to grind it, thereby freeing the larger metallic particles, and utilize the fine material in the manufacture of refractory brick, thus using the cobbing over and over again. There is, of course, some slagging action and a certain amount of chromium goes to the blast furnace where the mushy slag is formed, but in small amounts it is easily taken care of, and eventually the accumlated stock will be "worn out" and sent to the dump. There are also possibilities of treating this material by converting it into ferrochrome or by making chromate salts.

This experience suggests that chrome brick is not especially suitable for this class of work, and that magnesite should be used if possible. Experiments indicate

*A paper by Francis R. Pyne to be read at the New York meeting of American Institute of Mining Engineers, February, 1918.

that the tendency of the magnesite to crack and spall can be overcome by subjecting the brick to pressure before burning, which should also cause less metal absorption. There is also no difficulty in treating the cobbing in the blast furnace.

Electrolytic Antimony from Stibnite*

The experiments here described were first made on a small scale at the Ohio State University. Antimony was deposited at the rate of about a pound a day on cathodes, 12 x 12 in. suspended in a tank, 60 x 18 x 18 in., using a current density of 7 amp. per sq.ft. at 2.7 volts. The electrolyte was an 8% NaOH solution to start with and was kept constantly in circulation in a closed circuit through the leaching tank and the electrolytic tank. Iron electrodes, the cathodes being perforated, were found to be best.

Satisfactory Deposition on Perforated Iron Anode

The antimony deposited in a firm, hard sheet which locked itself through the perforations and could be made as thick as desired without any tendency to fall off. It was not necessary to grease the cathodes. To strip the deposit from them it was only necessary to strike a few sharp blows with a mallet, when it cracked off in large cakes, leaving the cathode ready to be used again. It was easy to obtain deposits an inch in thickness or as heavy as a man can comfortably lift.

The solution of stibnite in an NaOH or Na_2S solution is expressed by the reactions: $Sb_2S_3 + 2NaOH = NaSbS_2 + NaSbSO + H_2O$ and $Sb_2S_3 + 3Na_2S = 2Na_3SbS_3$, which proceed rapidly, especially if the solution is warm. When the solution is electrolyzed the reaction at the cathode seems to be: $Na_3SbS_3 + 3H = Sb + 3NaSH$, while at the anode sodium thiosulphate and Na_2S_2 are formed by oxidation. If the electrolyte is evaporated to a small volume and cooled, a great crop of brilliant crystals of Schlippe's salt ($Na_3SbS_4 9H_2O$) separates.

Anode Is Attacked Unless Solution Is Regenerated

The 8% NaOH solution will hold about 3% Sb at first, but as thiosulphate accumulates the solvent power of the solution decreases until there has accumulated one atom of sulphur for each atom of sodium present when the solvent power has dropped to about 0.7%. When this amount of sulphur has gone into solution the iron anode suddenly commences to be attacked, falling to pieces rapidly, the iron changing to FeS. At this point the solution must be regenerated unless an insoluble anode can be found. A graphite anode falls to powder, copper changes to copper sulphide, Duriron is rapidly attacked, but lead is almost unaffected. The surface of the lead becomes covered with a coating of PbO_2 apparently, which somewhat increases the voltage but protects the lead from attack. Aluminum or magnetite might do but have not been tried.

The quality of the antimony deposited, when the iron anodes are being destroyed, does not seem to be injured if the anode is enclosed in a bag to keep the sulphide of iron from being mechanically carried to the cathode. In fact, one run was continued for five or six days after this point had been reached, very pure antimony being produced with about the same electrical efficiency. The sulphur during this stage is being continually removed as FeS. The antimony in solution remains at about 0.4%. The current efficiency during the entire run was 76%, which was also obtained on large scale experiments. The antimony contains about 0.02% sulphur, 0.01% arsenic, no lead and a trace of iron, analyses being made after melting.

Accumulation of Sulphur in Solution Harmful

The drawbacks to this process are comparatively low solubility of antimony in the electrolyte (this is increased by warming), accumulation of sulphur in the solution, decreasing its solvent power and causing destruction of iron anodes when there has been deposited 1 lb. of antimony for each pound of NaOH used. More antimony can be deposited, but at the cost of destroying the anodes. In one experiment 17 lb. of NaOH were dissolved in 210 lb. of water and circulated through the leaching tank and electrolytic tank with a current density of seven amperes per sq.ft. of cathode surface. This was continued until the anodes began to be attacked. The antimony was then weighed and was found to be 17 lb., indicating that the reaction at the cathode is $Na_3SbS_3 + 3H = 3NaSH + Sb$, introducing one atom of sulphur for each atom of sodium. The amount of thiosulphate at the end of the run was 4%, while the amount of sulphide sulphur, figured as Na_2S, was about 2%. After the anodes began to be attacked, the electrolysis was continued for several days with the anodes enclosed in cotton bags and the deposition went on without further difficulty.

Larger Scale Plant Confirmed Early Tests

As a result of these experiments a plant on a large scale was built, with a capacity of 5000 amp. and 7.5 volts, which was capable of producing about 600 lb. of antimony per day. The current efficiency on this scale was 76%, the same as obtained in the laboratory, and the metal was of the same quality. The metal, when melted in a Monarch furnace and cast in iron molds properly covered with slag, "starred" beautifully.

At the point where the anodes are attacked it becomes necessary to regenerate the solution or furnish a new one. If a new solution is applied it means the consumption of 1 lb. NaOH per lb. of antimony. The best way to handle the situation, as far as tests indicate, seems to be to evaporate the solution to dryness with the exhaust steam, shovel the residue into a reverberatory furnace and roast to get rid of about half the sulphur, thus changing the thiosulphate to sulphate; then mix with coal and heat until it has all been reduced to Na_2S, which quickly dissolves stibnite and can be put into the circuit again. Small-scale experiment shows this to be successful, but it has not been tried on a large process scale.

To summarize, it is demonstrated that stibnite dissolves easily in NaOH or Na_2S, from which antimony in a high state of purity is precipitated with a current efficiency of about 76%, a voltage of 2.7 giving a power cost about equal to that of the electrolytic production of zinc. The solution must be regenerated or renewed when 1 lb. of antimony has been produced per pound of NaOH used.

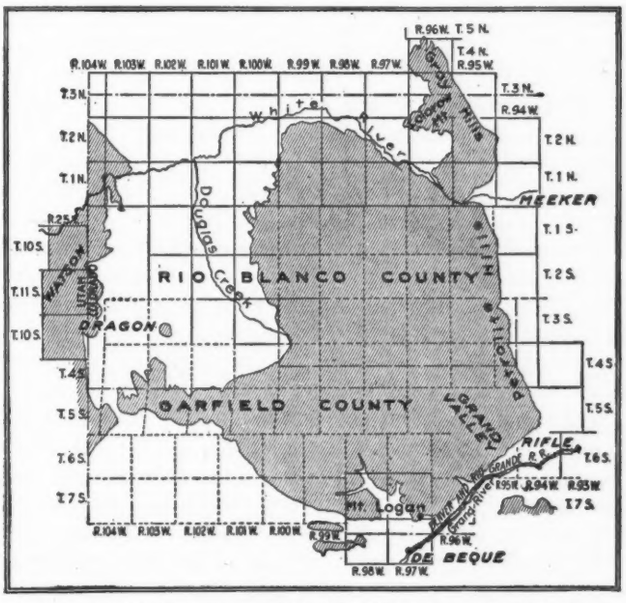
*Excerpts from a paper entitled "Electrolytic Production of Antimony," by Prof. D. J. Demorest, of Ohio State University, printed in "The Journal of the American Institute of Metals," Vol. XI, No. 1.

The Search for New Oil Pools in the United States

BY DORSEY HAGER*

The greater part of the probable productive area has been mapped and studied by geologists. In general, productive sedimentary areas are not closely related to those of igneous origin. New developments are predicted in old productive fields. The author advises the testing of studied areas where stratigraphic conditions are favorable, and believes that oil will be found in some regions that cannot be mapped geologically. Attention is called to vast quantities of oil shale in several states and a great future is predicted in the mining of it.

OUR present supply of crude oil, especially light oils of refining value, is unquestionably diminishing, despite efforts to maintain production. Questions often asked are: "Is it possible to obtain new production?" and "Where is more oil to be found?" A



MAP OF NORTHWESTERN COLORADO, THE SHADED PORTION SHOWING GREEN RIVER OIL SHALE

review of the general situation indicates that the chances of obtaining new pools of magnitude are limited. There are probably no great supplies of oil left untouched by the drill.

Geologists are not infallible in their predictions, but recently far more careful and thorough geologic work has been done than in the past. The United States has been intelligently mapped and studied, and one can now draw sound conclusions within well defined limits. In the following discussion, I refer particularly to those areas of sedimentary rocks which are characterized by sandstones, limestones, sand and shales, as distinct from the areas of igneous rocks typified by granites, syenites, and basalts. It is difficult to draw hard and fast distinctions, as in many places—California, Colorado, Wyoming and even in southern Oklahoma—granitic formations are close to productive petroleum areas. In several of the California oil fields and in many in Mexico basalt intrusions are found, but in general the productive sedimentary areas are not closely related to the igneous. I believe that oil will be found in areas that cannot be mapped geologically, but these are few.

The topography of Kansas, Oklahoma and north Texas lends itself readily to geologic survey. During the last four years, 1913-1917, these states have been subjected to a fine-combing by geologists. Several hundred men have been engaged in mapping this territory, with the result that few areas remain unmapped or untested by the drill and these are far from promising. More intense drilling, the finding of deeper sands, and the extension of some of the older pools will assist in maintaining a large production, but hope for "new production" in this region is slight.

Southern Texas and southern Louisiana may develop new pools, but from a geological standpoint predictions are difficult to make, as the soft sediments covering these areas preclude satisfactory geologic work. The opening of a pool in New Iberia Parish, Louisiana, and the Damon's Mound and Goose Creek oil pools, in Texas, lend encouragement to intense prospecting wherever saline domes or gas seepages are discovered.

FAIR PROSPECT OF A BIG FIELD IN SOUTH

Mississippi, Alabama, Georgia and Florida are states wherein fair oil prospects exist. At present, anticlines near Vicksburg and Jackson, Miss., are being drilled, but the depths to the supposed oil horizon are great—3500 to 5000 feet—and it will be some time before the drill gives a record. Structure similar to the Texas and Louisiana saline domes exists in the Gulf Coast areas.

Alabama presents some interesting possibilities. The great Hatchitigbee anticline is soon to be tested. The Jackson anticline and one near Geneva, Ala., and crossing the Georgia line are also to be drilled for oil. If size of structure counts, Alabama and Georgia should produce several remarkable pools. The Eutaw "sand," corresponding closely to the Caddo formation of Louisiana, is the most likely horizon.

Southern Georgia and northern Florida present stratigraphic conditions favorable for oil. It is possible that pools will be developed there, but improbable. However, until a few wells are drilled to test these areas, it is unsafe to make positive predictions.

MIDDLE STATES WELL PROSPECTED BUT MAY CONTAIN POOLS OF MEDIUM SIZE

Arkansas seems to have been eliminated as an oil possibility. That state has produced gas in abundance, but so far no oil of commercial importance has been found. Any petroleum existing there in earlier times was in all probability subjected to heat and volatilized

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into gas, as is thought to be the case in the anthracite region of West Virginia and Pennsylvania.

Tennessee holds promise of several small pools along the Cincinnati arch, where the Ordovician and Devonian beds may carry oil, and also in the eastern part, where an extension of the Pennsylvania sediments may be productive. Careful, intensive work may bring out several pay pools, but sand conditions appear less satisfactory than in Kentucky, where the Rough Creek uplift, extending from western to eastern Kentucky, exhibits several promising domes. The Paintsville and Rock Creek domes, in the eastern part of the state, are large untested structures. A dome also occurs near Lebanon, in central Kentucky, which may prove important in horizons below the Devonian. A successful test on this fold would open possibilities of deeper sands that would be well worth while. The Leitchfield-Hartford area, in western Kentucky, may also prove up several commercial fields, as a small well has just been drilled on structure near Leitchfield.

Illinois, Indiana and Ohio have not been fully prospected. They are more difficult to work because of the glacial drift which covers so much of these states, but still present opportunities for several new pools. In Illinois the Niagaran horizon seems particularly worthy of further testing. West Virginia and Pennsylvania have been well prospected, and there is little probability of opening new pools. Careful prospecting should disclose a few pools that have been overlooked.

Untested Areas Still Exist in California and in the Intermountain States

California has been well surveyed. There are several known prospects left untested, notably a big fold in the Cholame Hills district, in Monterey County (which is in questionable territory, but is too important to remain untested at such a time) and two folds near San Juan Capistrano, about 100 miles north of San Diego, Calif. Any oil found in these areas will likely occur in the basal Monterey beds of the Middle Miocene.

Wyoming presents a large amount of untested acreage, but several large companies and the United States Government control the land situation; so that the small operator has difficulty in conducting operations. The Government should do something toward encouraging development in this area, or should itself develop it to supply the needs of the Army and the Navy. Wyoming has attracted much interest this year. The Big Muddy dome is showing an excellent production both in shallow and deep sands and is booming Wyoming oil. There remain several untested areas in south-central Wyoming, which, though deep, are worth watching; notably the Medicine Bow and the Simpson Ridge anticlines. Those at Buck Springs and at Sand Draw are also interesting.

If the Government withdrawals did not cover such a large part of the most promising acreage, Wyoming would have an oil boom of magnitude. However, the situation for the independent producer has been greatly improved as the result of the entrance of the big Mid-Continent producers, who are strong enough to build pipe lines and refineries of their own.

Oil prospects in Montana are not as favorable as are the prospects for gas. There are several untested domes that occur in the Big Horn basin area, and they may produce oil. Certainly that part of Montana is worth testing, but it has the same status as Wyoming.

New Mexico, Utah and Colorado all have showings of oil. Colorado has several small, producing pools and some chance of opening new ones both east and west of the Rockies. The axial anticline south of Craig in Moffat County, Colorado; the big structure north of Meeker in Rio Blanco County, and several other domes may be found productive, but petroleum, if found, will in all probability range from 4000 to 5000 ft. in depth. The horizon will be the lower Cretaceous. In eastern Colorado the Great Plains region may develop pools, but favorable geologic structure is scarce and drilling will be haphazard, except in areas around Las Animas and La Junta, where several domes are known. Drilling there will test the Pennsylvanian horizon.

New Mexico is being prospected, but to date it has given little encouragement to the oil operator or to the geologist. Utah will in all likelihood produce several oil pools. The San Juan field offers encouragement to further prospecting, especially in eastern Utah.

Lower Missouri Valley States Wildcat Territory

South Dakota, Nebraska, Iowa and Missouri may be grouped as distinctly "wildcat" states. No oil of commercial importance has yet been found in them, although they are within the bounds of probable oil territory and tests are justified where favorable geologic structure and auspicious stratigraphic conditions are thought to exist. Those parts of South Dakota and Nebraska bordering the Black Hills region contain geologic structure conducive to oil accumulations, and if the stratigraphic conditions are favorable, commercial pools may be developed. Known domes are at Chadron, Nebraska and Edgemont, South Dakota.

Iowa and Missouri have, to date, no commercial oil pools; but possibilities of small pools in the southern part of Iowa and the northwestern part of Missouri are not out of reason.

"Mining for Oil" in the Future

I am not sounding the trumpet of an alarmist, but pointing out the areas that seem likely to give new pools. Intense development of our present pools will furnish our immediate needs for several years, but no optimist should hope for increasing production from them. The development of foreign pools, especially in Mexico, will give us much oil. However, our great future supplies of petroleum must come from the development of our oil-shale resources, which, within the next five years, should constitute one of our big industries.

There are vast quantities of oil shale in California, Montana, Wyoming, Colorado and Utah. The extent of a known area in northwestern Colorado, now being developed, is shown in the accompanying illustration. These shale areas will be developed in time on as safe and sane a basis as our coal mines of today. When that time arrives, the romance of oil prospecting will have fled, and the whole complexion of oil producing will change. It will, literally, be oil mining with steam shovels in openpits and glory holes; and, later, tunnels and adits. There will be no lack of oil products for several generations to come, but the true oil fields of today will probably disappear within another generation, and be replaced by oil mines.

Bauxite in the Coastal Plain of Georgia*

The bauxite deposits of the Coastal Plain in Georgia occur as lenses in clay interbedded in nearly horizontal sands, marls and limestone of Cretaceous and lower Eocene age. Ores low in iron are suitable for manufacture of alum and those above 2% ferric oxide are used for the manufacture of aluminum. The deposits are shallow and are mined by stripping and opencut methods.

FOR practical purposes bauxite may be defined as an ore and not a mineral, being a hydrate of alumina, or a mixture of several hydrates of sufficient purity to serve as a commercial source of aluminum or its salts. The definite hydrates of aluminum are diaspore ($Al_2O_3.H_2O$), and gibbsite or hydrargillite ($Al_2O_3.3H_2O$).

Aluminum is the most abundant metal in the earth's crust. It has a great affinity for silicon and is never found in the native state. Unusual geological conditions are necessary to produce the oxide or hydroxide, and no method of extracting aluminum from its silicate on a commercial basis has yet been successfully developed. The aluminum anhydrous oxide, corundum, is used mainly for abrasives, and bauxite forms the only source of commercial aluminum.

Bauxite Occurrences Comparatively Limited

Bauxite is found in a limited number of localities widely distributed over the earth. All known deposits are comparatively small, and the rapidly increasing demand for aluminum will soon cause an exhaustion of the present known sources of supply. New discoveries, however small, are therefore important. There are well-known deposits of bauxite in France, Germany, Austria, Ireland and India. In the United States, the main occurrences are in Arkansas, New Mexico, northern Georgia, Alabama, Tennessee and in the Coastal Plain region of Georgia.

In northern Georgia, Alabama and Tennessee the principal deposits occur in the valley of Coosa River between Adairsville, Ga., and Jacksonville, Ala., but several important occurrences are found in Tennessee near Chattanooga. Here the deposits differ from all other American and most foreign deposits in so far as they are not bedded and are not the products of weathered rocks. The production from this region has declined in recent years. Small bauxite deposits occur in Virginia and Pennsylvania, but are not commercially valuable.

Arkansas has produced 80% of the bauxite mined in the United States since 1910. The ore is a residual product from the weathering of a nepheline syenite which outcrops in two areas in Saline and Pulaski counties. The beds of bauxite reach a thickness of 30 ft., averaging from 11 to 12 ft., and occur as irregular deposits overlain by the Tertiary sedimentaries. In New Mexico, near Silver City, an area, covering approximately one-half mile square in nearly horizontal beds of volcanic porphyry and basaltic breccia, contains deposits of bauxite that are not available at present on account of transportation difficulties.

Deposits of the Coastal Plain in Horizontal Cretaceous Beds

The bauxite deposits of the Coastal Plain of Georgia were discovered by Otto Veatch, assistant state geologist of Georgia, during a state geological survey for clay. The first shipments were made from Wilkinson County, in 1910, by the National Bauxite Co. The Coastal Plain part of Georgia lies south and southeast of the Piedmont Plain, the line of division passing through Columbus, Macon, Milledgeville and Augusta. This area, of approximately 35,000 square miles, is underlain by Cretaceous and later sedimentaries; and also several thousand square miles of crystalline rocks underlying the sedimentaries. The Fall Hills area is the most distinctive of several low ranges and lies in a belt 40 to 50 miles wide, ranging across the state just south of the Fall line. The Cretaceous and Eocene beds lie in a belt along the Fall Hills in which occur the bauxite and fuller's earth deposits of the state. The region is a low plain having an average tilt, southward and toward the sea, of 3 to 4 ft. per mile, with an elevation ranging from sea level to 700 ft. along the Fall line. The sedimentary beds are almost undisturbed, having a slight folding in broad anticlines and synclines. This folding has somewhat affected the drainage of the area, which has cut deep valleys through the Fall line hills by rivers rising in the Piedmont region. The crystalline basement has a slope of 50 to 75 ft. per mile. The lower Cretaceous dips 40 ft. per mile; the younger formations have progressively lower angles of dip up to the Alum Bluff formation, which lies approximately horizontal. Within the Coastal Plain all economic deposits of clay or bauxite have assumed the form of nearly horizontal beds and lenses.

The underlying sedimentaries consist of beds of Cretaceous and younger sands, clays, marls and limestone, lying unconformably upon eroded crystalline rocks of pre-Cambrian age. The beds are largely unconsolidated. show but little alteration, and no great orogenic movements have taken place. The only disturbance is a general uplift with slight tilting and warping. The beds have a thickness ranging from 4000 to 5000 feet.

Bauxite Interbedded with Clay in Lenses

The pre-Cambrian igneous and metamorphic rocks consist of granite, gneiss, schist, and basic eruptives, and highly metamorphosed shale, sandstone and limestone. The erosion of these rocks has made the later sedimentaries. The Paleozoic and lower Mesozoic series are entirely absent in the region, the lower Cretaceous beds overlying the older rocks, representing thereby a long period of erosion during which intensive weathering took place. The lower Cretaceous beds consist chiefly of coarse, cross-bedded, arkosic sand and subordinate lenses of white clay or kaolin. Bauxite is interbedded in lenses with white clay. The series has no marine fossils and is of shallow, fresh-water origin. The

*Excerpts from report of H. K. Shearer, assistant state geologist, Bull. 31, Geol. Surv. of Georgia.

coarse sand and pure kaolins were derived from long weathering of the crystalline series. The absence of limestone is notable and significant of deposition of completely weathered material in shallow water.

The Midway formation of the upper Cretaceous has a thickness of 400 ft. and consists of ferruginous sand and local beds of white clay with fossiliferous limestone, marl, clay and calcareous quartzite. Above the higher limestone of the section there are a series of shallow water deposits consisting of coarse sand and white clay, lenses and associated bauxite, almost identical with the other beds of the lower Cretaceous in appearance and composition.

Aluminum from Ores Over 2% Ferric Oxide

The first bauxite ore mined in Georgia was from the lower Cretaceous deposits of Wilkinson County. Formations of bauxite are known in almost all parts of the county. All are at or near the contact of the Cretaceous with the unconformable overlying Eocene formation. The lower Cretaceous strata are exposed in the valley of Oconee River in the eastern part of the county and in the Valley of Commissioners and Big Sandy Creeks almost to the southern edge of the boundary. Ore is found along both sides of a small branch of Commissioners Creek. It lies in the form of a lens, but grades down to white or thin and modeled plastic kaolin overlain by sand and clays.

The Daniel property is about worked out. The bauxite graded into kaolin on the west, but was mined from an area of about 8000 sq.yd. by the Republic Mining and Manufacturing Co., which still has an area on the Parker property probably equally as large. The maximum height of overburden removed was 11 ft., and stripping and mining were all done by hand. The ore is dried in a rotary kiln and hauled in wagons one and a half miles to the railroad station at Wriley. It is low in iron and is used therefore for the manufacture of alum. The ore in the Honeycutt property contains 2% ferric oxide and is used for the manufacture of aluminum metal. The thickness of ore mined averages 5½ ft., grading off at the top and bottom. The ore shipped averages 55% Al_2O_3 and weighs 3300 lb. per cubic yard.

Irregular Bauxite Lenses Near Toomsboro

The General Bauxite Corporation controls a property three miles west of Toomsboro, from which bauxite ore has been mined from 11 pits. Pit No. 11, the last, shows a sandy soil containing fragments of bauxite 1 ft. thick, overlying a white bauxite ore of medium hardness containing hard pisolite up to 1-in. diameter, or a total thickness of 6 ft., and grading below for a thickness of 1 ft. into a somewhat plastic kaolin. This ore occurs in small irregular lenses cut by "chimney rock," overlain by sand, and was mined for a thickness of 5 ft. The ore averaged from 53% to 56% (Al_2O_3) and contained less than 2% ferric oxide. Silica was not too high for the manufacture of aluminum, the ore averaging 52% Al_2O_3 as shipped. Some shipments ran as high as 58%. There is also a large low-grade deposit of clayey bauxite averaging 50% Al_2O_3. Mixed with plastic clay this material would make a fire brick of superior quality. Other properties of less importance in the vicinity of Toomsboro are of the Cannon and Cason. From the Cason property 4000 tons of 60% Al_2O_3 bauxite ore has been shipped, but only about 1000 tons are estimated as remaining.

In the vicinity of McIntyre are the Holleman, Underwood and Fountain properties. The deposits of bauxite in this district occur as boulders in a sandy soil, with little or no ore in place. The original deposits have been removed by erosion and the boulders are the remnants. The Dupree, Jones and McNeal properties in the vicinity of Irvington have low-grade alumina and high silica- and iron-content ores. The Butler property, north of the McNeal deposits, has several shallow pits, showing only yellowish, slightly bauxite clay, with occasional soft, light-colored nodules. The Sheppard property adjoins the Jones and Dupree on the southeast. The bauxite is light colored. In the valley bottom a number of acres is strewn with fragments of indurated clay and bauxite, some of the latter being of the high pisolitic variety with flinty matrix. An average sample of the bed exposed in the pit shows a thickness of 4 ft. and an alumina contents of 49.33%, silica 25.06% and ferric oxide 2.09 per cent.

Both Bauxite and Kaolin Mined at Gordon

The Columbia Kaolin and Aluminum Co. has a property three miles south of Gordon and a tramway to connect. The intention is to mine both bauxite and kaolin. A large area, at least half a mile in length, is strewn with fragments of indurated kaolin, and numerous small outcrops occur. Several shallow pits cut more or less indurated clay with scattered nodules. An analysis of the ore shows silica 10.92%, alumina 57.29% and ferric oxide 1.13%, which is an ore of good quality for the manufacture of alum. The quantity is not large, as the bed, 8 ft. thick, underlies a possible area of only an acre or two. The overburden consists chiefly of argillaceous red sand, and will not exceed a thickness of 10 ft. at any point.

In Baldwin County the Ethridge property, two miles northeast of Stevens Pottery, shows an area of several acres on the north slope of a hill strewn with float ore. A shallow pit cuts only Tertiary sand. A second pit, 10 ft. lower, cuts a foot of bauxite, with hard nodules predominating over the softer matrix, and grading down into iron stained kaolin. A third pit 10 ft. lower cuts a foot of clayey bauxite with hard nodules, also grading down into stained kaolin. The ore found on the surface is hard, white, and apparently of good quality. The structure is coarsely pisolitic, with simple nodules over half an inch in diameter. The quantity in sight is too small to be of commercial value, but the quality is good and it is not impossible that a workable bed might be found by more careful prospecting.

Lower Cretaceous Unfavorable for Bauxite

In Twiggs County the lower-Cretaceous strata are exposed in all valleys in the northern part of the county, but up to the present no bauxite likely to be of commercial value seems to have been discovered. At Myrick Mill, on Big Sandy Creek, in the northeastern part of the county, is a bed of indurated, nodular clay, which has a superficial appearance much like bauxite, but low alumina content. A part of the kaolin in the mine of the Georgia Kaolin Co. is slightly bauxitic. Southwest from Twiggs County, to Chattahoochee River, kaolin beds become less extensive, and no bauxite is known.

The area of bauxitization of the Cretaceous kaolin extends from Wilkinson County, across the Oconee River into Washington County, near Oconee Station. The property of L. A. Grable lies from one to two miles southwest of Sheppards Bridge over Buffalo Creek, where there are a number of exposures of more or less bauxitic, nodular and indurated clays. A few pits have been dug, but no bauxite of workable grade has been found. Nevertheless, the area between Buffalo Creek and the Oconee River is worthy of careful examination. Northeast from this point to Augusta there are abundant exposures of Cretaceous kaolin, but traces of bauxitization were noted at only one point. In the lower portion of the kaolin bed at the plant of the Albion Kaolin Co., near Hephzibah, Richmond County, are a few scattered, hard nodules of bauxitic materials.

The Midway formation occurs in a narrow belt extending from Fort Gaines, on Chattahoochee River, to Montezuma, on Flint River, and thence a short distance into Houston County. The average width of the belt is 8 to 10 miles. It is the surface formation over parts of Clay, Quitman, Stewart, Randolph, Marion, Schley, Webster and Macon counties. The bauxite deposits of the lower Eocene are associated with a horizon of plastic to indurated and nodular white sedimentary kaolin and white kaolinic and micaceous sand, which extends from Flint River, in northern Sumter County, to Macon County and the eastern part of Schley County. The beds of this horizon cap the hills near Ideal, Macon County, and dip beneath the level of Flint River a little below Copperas Bluff, Sumter County. During the time of formation of these beds, the depositional conditions were practically identical with those which existed during the lower Cretaceous period.

Bauxite Deposits Close to Surface

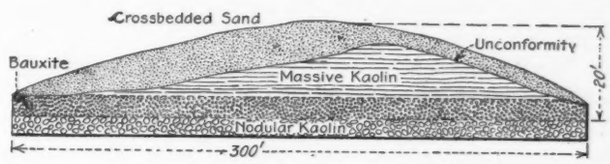
In Sumter County the Sweetwater mine is situated one and a half miles west of Flint River, and is operated by the Republic Mining and Manufacturing Co. The bauxite has the form of a true bedded deposit, conformable with both underlying and overlying strata. An analysis of certain samples from the working face showed alumina 56.3%, silica 11.8%, and ferric oxide 1.8%. Most of the ore contains less than 2% of ferric oxide, and is used principally in the manufacture of alum and other aluminum salts. The ore carrying more than 2% of ferric oxide is used in making aluminum. All work, both mining and stripping, is done by manual labor, although this is apparently not the most economical means of handling an overburden which averages 30 ft. of soft material over a large area.

The outcrop of ore has a length of 1300 ft., so the deposit may safely be assumed to have the form of a half-circular lens of that diameter. The average thickness is 4 ft. and the tonnage estimated would be 175,000. Recent production is about 1000 tons per month.

The Thigpen property lies to the west. The Republic Mining and Manufacturing Co. has the refusal of the deposits, but no mining has yet been done. The bauxite deposit lies across the valley of Big Branch from the Sweetwater mine, and at the same altitude. There is a possibility that the two deposits may have been continuous before the valley was cut. The Easterlin mine lies on the south side of Sweetwater Creek, three and a half miles from Flint River. The bauxite outcrop is 30 ft. above the level of Sweetwater Creek, being a lens of bauxite in a bed of kaolin. The bauxite caps a small knoll and outcrops around the slope of a hill, making a great surface showing, having no overburden for a considerable area. An analysis of this ore shows alumina 60.22%, silica 5.65% and ferric oxide 2.42%.

In Macon County there are two groups of bauxite deposits. One group is in the southern part of the county, close to the Sumter County line, along Boggy Branch, a tributary of Camper Creek, and the other is in the center part of the county of Buck Creek. Two small properties, purchased in 1915 by the National Bauxite Co. and later transferred to the Kalbfleisch Corporation, of Chattanooga, Tenn., are situated on the south slope of Boggy Branch, two and a half miles north of Andersonville, and one and a half miles from the closest point on the Central of Georgia R.R. The bauxite exposures are found in two spurs of a hill, running north toward Boggy Branch, with a slight valley between. On the first, large blocks of hard bauxite are found in the soil, covering a part of the slope. On the second spur, about 200 yd. southwest, exploration work shows that the bauxite bed extends for a distance of 200 yd. around the slope. Most of the work has been done by boring, but one pit penetrates thickness of the deposit. The ore resembles that of the Sweetwater mine.

The English property lies on the north slope of Boggy Branch, just opposite the National Bauxite Co.'s prospect previously described. The deposit is small, but



SECTION OF BAUXITE DEPOSIT AT SWEETWATER MINE, SUMTER COUNTY, GEORGIA

of fair quality and favorably situated with respect to transportation. The Kleckley holdings are situated on the south slope of the valley of Buck Creek, in the western part of Macon County, eight and a half miles west of Oglethorpe, but the lower slope on this property consists of more or less pure kaolin and fireclay, prevailingly white, and containing lenses of indurated nodular clay and bauxite, mantled by a few feet of gray or red sand. The hills are capped by red sand of the Wilcox formation, which overlies the white clay unconformably. Other properties have been known or partly developed in this vicinity. Bauxite has been discovered in the extreme southern part of Macon County and belongs to the Camper Creek group. In Schley and Stewart counties deposits are known to exist, but little work upon them has yet been done.

Mining by Stripping and Opencut

The methods used in mining bauxite in the Coastal Plain are the simplest possible. Every deposit worked up to the present time has had an outcrop at some point on the slope of a hill, and mining consists simply in removing the overburden and working out the ore. The maximum known thickness of ore is about 10 ft., while overburden as heavy as 40 ft. has been moved in places to get 5 or 6 ft. of ore. All mining is done by manual labor, the ore and overburden being trammed to the dumps by hand or mule power. Steam shovels and

drags have not been employed in any of the bauxite mines, but they are used extensively in kaolin and fuller's earth mines in the vicinity. Their use in bauxite mining would certainly be economical in the larger deposits with heavy overburden. Both ore and overburden are so soft that blasting is rarely necessary.

As a rule, the upper surface of the bauxite forms a fairly sharp contact. In cases where an unconformity cuts off the top, the upper surface of the ore is rendered irregular by pot holes and gullies, but there is no difficulty in distinguishing the place where the ore commences. The lower limit of workable ore, however, is not so easily determined, because there is usually a gradual change from bauxite to kaolin extending through a number of feet. Most of the ore is used in the manufacture of alum by treatment with sulphuric acid, 50° B., in which the alumina combined in silicates, such as kaolin, is not readily soluble. The only means of finding out just how much of the clayey material may be mined and used as ore is by keeping a check on the shipments, especially at first, by chemical analyses. The usual practice is to work far enough into the clayey bauxite so that the mixed material, when dried, will contain about 50% of soluble alumina, as the alum manufacturers do not usually wish to purchase ore of lower grade than that.

Ores Kiln-Dried Before Shipping

The only treatment given the bauxite of the Coastal Plain previous to shipment consists in drying and, occasionally, screening. There are small quantities of bauxite which could be enriched by washing with a log washer, such as is used in the treatment of iron and manganese ores and bauxite in north Georgia, but no such washer has yet been installed.

The ore as mined contains a variable but large percentage of uncombined water, which adds greatly to the freight charges. It is customary, therefore, at all of the larger mines to dry the ore artificially before shipment, although that from several small deposits of high-grade bauxite is simply air-dried in sheds or on board floors in the sun. The driers used are slightly inclined, rotary-cylinder kilns, about 30 ft. long by 3 or 4 ft. in diameter. They are usually heated by wood fires, the wet ore passing downward toward the flame. The dried ore is mechanically elevated to overhead bins, from which it is loaded on wagons or trucks by gravity. The drier at the Sweetwater mine is said to reduce the weight of the ore 10 per cent.

It is not advisable to heat the ore so highly as to drive off a large part of the combined water. Experiments show that calcining reduces the solubility of the alumina in sulphuric acid of the strength used, although the effect is not great until about 80% of the total combined water is removed. In the type of kiln used it is not likely that more than a small percentage of the combined water is expelled. A small amount of the pebble ore is screened to remove admixed sand and clay. The screens used are flat, inclined screens or revolving trommels of about ⅜-in. mesh. The bauxite districts are well supplied with railroads. All of the deposits are within 10 miles of railroad connections, but none so far worked are more than four miles from loading points. The ore is usually hauled to the railroad station in wagons, but one company has recently put a motor truck into service. The truck has a capacity of four tons, and carries 10 loads per day 3½ miles to the station.

In the Sumter and the Macon county district good sand-clay roads have been built, while in Wilkinson County the materials for constructing such roads are available, but so far they are only partially improved.

The known lenses of bauxite cover only a minute fraction of the area of the outcrop of the formations in which they are known to occur. There are almost certainly buried deposits which give no surface evidence of their existence, but the chances of finding them by random test holes are small even in the most promising localities. Therefore, boring where there are no surface indications of bauxite is not advisable. When fragments of bauxite or indurated, nodular clay are found on a slope, pits or trenches should be sunk near the highest point at which such fragmental material is found. It is best to first dig pits around the edge of the orebody, in order that the workable thickness may be determined and representative samples obtained, after which a common clay auger, 2 or 3 in. in diameter, may be used to further investigate the character of the orebody where the overburden is heavier.

The Fuel Value of Wood

Those who plan to relieve the coal shortage this winter by burning wood can figure, roughly, that two pounds of seasoned wood have a fuel value equal to one pound of coal, according to experts of the United States Forest Service. Different kinds of wood have different fuel values, and in general the greater the dry weight of a nonresinous wood the more heat it will give out when burned. For such species as hickory, oak, beech, birch, hard maple, ash, locust, longleaf pine or cherry, which have comparatively high fuel values, one cord, weighing about 4000 lb., is required to equal one ton of coal; it takes a cord and a half (a total weight of 4500 lb.) of shortleaf pine, hemlock, red gum, Douglas fir, sycamore or soft maple, which weighs about 3000 lb. a cord, to equal a ton of coal; while of cedar, redwood, poplar, catalpa, Norway pine, cypress, basswood, spruce and white pine, two cords, weighing about 2000 lb. each, or 4000 lb., are required.

Weight for weight, however, there is little difference between various species. Resin affords about twice as much heat as wood, so that resinous woods have a greater heat value per pound than nonresinous woods, and this increased value varies, of course, with the resin content. The available heat value of a cord of wood depends also on the amount of moisture present. The greater the amount of water in the wood the more heat is lost. Furthermore, cords vary as to the amount of solid wood they contain, even when they are of the standard dimension and occupy 128 cu.ft. of space. A certain proportion of this space is made up of spaces between the sticks, and this space may be considerable in a cord of twisted, crooked and knotty sticks. Out of the 128 cu.ft., a fair average of solid wood is about 80 cu.ft. This, however, applies to the standard cord, in which the sticks are cut to 4-ft. lengths and piled 4 ft. high and 8 ft. long. Instead of the 4-ft. lengths, however, users often have the sticks cut into 2-ft. lengths. Care should be taken to see that full measurement is given when wood is bought in this way.

Where wood is to be burned in a furnace intended for coal, it will be found desirable to cover the grate partly with iron or firebrick, in order to reduce the draft. If this is not done, the wood is wasted by being consumed too fast, and makes a very hot fire, which in a furnace may damage the firebox.

Foreign Trade in Lead and Zinc

Imports of lead during September, October and the first ten months of 1917 are reported by the Department of Commerce as follows:

Articles and Countries	September Contents, Lb.	October Contents, Lb.	Jan.-Oct. Contents, Lb.
Lead Ore:			
Canada	21,795	57,600	8,051,922
Salvador	.....	.....	3,117
Mexico	937,633	1,237,969	13,538,816
Chile	.....	728,000	1,922,749
Peru	.....	21,573	369,645
Italy	.....	.....	46,719
England	.....	.....	8,609,804
German Africa	.....	.....	4,405,145
France	.....	.....	120,102
Panama	.....	.....	6,084
Others	.....	3,888	6,379
Totals	959,428	2,049,030	37,080,482
Lead—Base Bullion and Bullion:			
Dutch East Indies	229,090	.....	837,028
Peru	14,058	11,711	76,154
Canada	139,033	7,329	1,312,293
Mexico	10,076,266	2,703,244	65,244,621
Totals	10,458,447	2,722,284	67,470,096
Lead—Pigs, Bars, etc.:			
Panama	938	.....	61,076
Barbados	.....	326	3,140
Colombia	.....	.....	3,155
Haiti	420	.....	39,133
Canada	.....	1,685	332,099
Guatemala	.....	.....	52,400
England	.....	.....	80,188
Mexico	1,555,533	1,079,243	6,144,515
Peru	.....	.....	18,948
France	.....	.....	89,086
Chile	.....	.....	8,769
British West Indies	.....	.....	27,313
Others	2,305	5,925	15,316
Totals	1,559,196	1,087,179	6,875,138

The gross weight of lead ore imported in October was 7010 long tons.

The actual tonnage of zinc ore imported in October amounted to 8946 long tons. The countries of origin and the metal contents were as follows:

Countries:	September Contents, Lb.	October Cotents, Lb.	Jan.-Oct. Contents, Lb.
Canada	964,000	1,333,925	8,724,714
Australia	.....	1,578,675	25,005,837
Mexico	6,924,290	4,702,033	83,703,983
Spain	.....	.....	12,166,840
French Africa	.....	.....	1,245,000
Italy	.....	.....	4,822,400
	7,888,290	7,614,633	135,668,774
Zinc in Blocks, Pigs, etc.:			
Costa Rica	312	264	7,579
Panama	19,956	1,202	49,932
Cuba	8,787	12,311	267,850
Mexico	.....	.....	3,318
Ecuador	.....	.....	7,580
Canada	.....	.....	31,805
Brazil	.....	.....	5,513
Colombia	.....	.....	6,000
Jamaica	.....	.....	2,165
Others	.....	1,670	5,705
	29,055	15,447	387,447

Imports of zinc dust in October, 1917, amounted to 87,300 lb., of which 67,200 lb. came from Japan, and the remainder from Canada.

Exports of lead and zinc were as follows:

Lead:	September Contents, Lb.	October Contents, Lb.	Jan.-Oct. Contents, Lb.
Pigs, bars, etc., produced from domestic ore	8,692,397	5,329,408	82,535,280
Pigs, bars, etc., produced from foreign ore	207,322	21,039,360	33,489,641
Zinc:			
Pigs, etc., produced from domestic ore	13,619,619	10,208,889	232,778,898
Pigs, etc., produced from foreign ore	39,249,110	4,901,762	110,922,956
Sheets, etc	3,878,504	1,905,783	25,225,287

Foreign Trade in Copper

Exports of copper from the United States in September, October, and the first ten months of 1917, are reported by the Department of Commerce as follows:

	Sept. Lb.	Oct. Lb.	Jan.-Oct. Lb.
Ore and concentrates, contents	444,684	573,241	4,873,733
Unrefined, in bars, pigs, etc	2,017,838	4,256,707	10,421,344
Refined, bars, etc	60,601,803	81,316,000	870,746,395
Old and scrap	4,347	60,542	950,276
Plates and sheets	2,817,476	9,442,509	33,377,546
Pipes and tubes	570,999	523,007	*6,165,581
Wire, except insulated	667,310	2,008,119	21,006,669
Composition metal, copper chief value	1,179,589	11,829	*1,199,825
Total	68,304,046	98,191,954	948,741,369

* Figures cover period beginning July 1.

The weight of ore exported in October was 5250 long tons, and of concentrates, matte and regulus, 5886 long tons.

Imports of copper in September, October and the first ten months of 1917 were as follows:

	Sept. Lb.	Oct. Lb.	Jan.-Oct. Lb.
Ore and concentrates, contents	13,279,521	14,206,272	125,854,042
Matte and regulus, etc	3,613,346	125,659	16,629,765
Unrefined, in bars, pigs, etc	21,409,698	18,747,533	289,911,088
Refined, in bars, etc	620,752	4,362,544	10,388,164
Old, etc., for remanufacture	752,254	1,583,587	17,599,686
Composition metal, copper chief value	13,997	31,002	398,074
Total	39,689,568	39,056,597	460,780,819

Ore imported in October weighed 32,605 long tons; concentrates, 14,103; matte and regulus, 150 long tons.

Coal in the Philippines

Heretofore the demand for fuel in the Philippines has been met chiefly by imports of Japanese, Australian and Chinese coal. The only coal mined in the islands has been in Cebu, and that has not been of satisfactory quality, and mining there is now carried on only in a small way. Recently, however, coal outcrops have been discovered on the Island of Mindanao and are being developed by a company called the National Coal Co., which has been formed in Manila, and in which the island government purposes to take an interest. To provide for these and other possible developments the Philippine Legislature recently passed a law governing the disposition of coal mines which may be found on the public domain. This law reserves the rights of the government in all coal deposits and places them under the jurisdiction of the Secretary of Agriculture and Natural Resources. They will not be sold, but may be leased in blocks of 400 hectares—988 acres—up to 1200 hectares to individuals or companies desiring to work them. No lease shall be granted unless the majority interest in the concern is owned by citizens of the Philippines or of the United States. The lessees will be required to pay a yearly rental of 2.50 pesos per hectare for the first year and 5 pesos each year thereafter, and there will be a royalty of not less than 10 centavos—5c.—per native ton on coal mined and sold. The government will retain a general supervision over all operations, and will not permit one concern to be interested in more than one lease at a time.

Where coal mines are opened, or operated on privately owned land, the operator will be required to pay a yearly tax of 1000 pesos on each 400-hectare tract, and a royalty of 4 centavos per ton on all coal mined. The discovery and exploitation of coal would mean much to the Philippines, where industrial development has been retarded by the scarcity and cost of fuel.

As an Artist Sees Utan Copper

"THE APPROACH" TO UTAH COPPER MINE AS PORTRAYED BY JONAS LIE

"GENERAL VIEW." ONE OF THE SERIES OF PAINTINGS DEPICTING OPERATIONS AT UTAH COPPER MINE

In producing his paintings of Utah Copper, Jonas Lie, the artist, has again displayed his ability to place on canvas an artistic interpretation of the industrial accomplishments of our age. Mr. Lie is already well known for his portrayal of the building of the Panama Canal. It is to be regretted that lack of space makes impossible photographic reproduction of Mr. Lie's paintings in full; also that the color of the originals is lost in reproduction

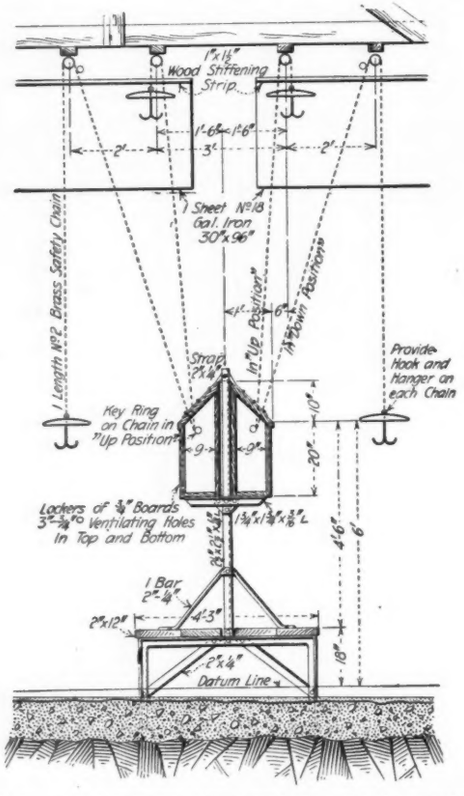
"FROM UPPER TRAMWAY STATION," SHOWING A PART OF BINGHAM IN THE FOREGROUND

"BINGHAM," AS IT APPEARS ON ONE OF THE CANVASES OF JONAS LIE'S UTAH COPPER SERIES

Details of Practical Mining

Dallas Change House at Bisbee

The importance of having a satisfactory change house where miners can not only change their clothes and bathe but also be sure of having dry "digging clothes" for the next shift is now well recognized. The old-style steel locker assured security against theft, but did not provide the proper drying facilities. The hook-and-chain system without locker has its objections, especially with regard to shoes, boots and hats, etc. In the drawing is shown a combination of both features—


1"x1½" Wood Stiffening Strip
1 Sheet №18 Gal. Iron 30"x96"
1 Length №2 Brass Safety Chain
Strap 2"x¼"
Key Ring on Chain in "Up Position"
Provide Hook and Hanger on each Chain
Lockers of ⅞" Boards 3"-⅞"ø Ventilating Holes In Top and Bottom
1 Bar 2"x¼"
2"x12"
2"x4"
Datum Line

DETAIL OF LOCKER-AND-CHAIN CHANGE HOUSE

chain hooks and locker—as used at the Dallas change room of the Copper Queen Consolidated Mining Co., at Bisbee, Ariz. Small lockers are arranged in tiers at a suitable height above a corresponding row of benches which is an improvement over boot boxes placed under benches as in some change-house designs. Each locker is provided with two chain hooks and coat forms, one at each end of a single length of No. 2 brass safety chain. The chain passes over two pulleys suspended from the roof truss at 90° to the line of lockers, and to the chain, at points each one third distant from the end hooks, is attached a key ring. Between each set of chains there is a partition at the top. As shown in the illustration, when one hook is up with one set of clothes the opposite hook is down with the other set of clothes, and either key ring can be locked in a fixed position to the locker, securing the owner against theft. The change house is heated by steam pipes arranged around the walls, and the rising heat performs the function of drying clothes that are properly exposed to the warmer air at the top of the building.

Thawing Frozen Ground by Hot Water*

Hot water as a substitute for steam is used in the Yukon for thawing frozen gold-bearing gravels preparatory to dredging operations. Tests showed that by the use of hot water four times the amount of gravel can be thawed in two-thirds the time with less than half the fuel necessary when steam is the medium employed. This is attributable to the great condensation losses that occur with steam and to the difficulty of driving the thawing points to bedrock at one driving in order that the thawing process may logically proceed upward from the bottom, rather than at irregular intervals from the surface down.

An average of 46% of the frozen material in place is ice. When this is melted, the boulders are loosened,

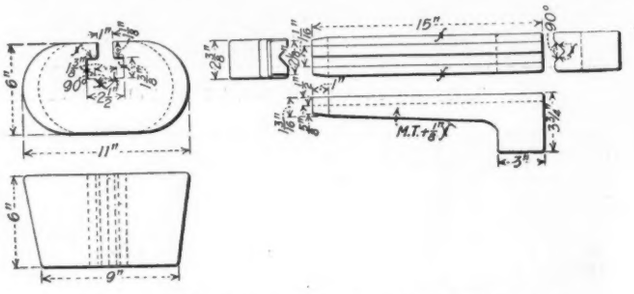


FIG. 2. DETAIL OF ANVIL ATTACHMENT FOR THAWING POINTS

so that a thawing process started at bedrock creates a subterranean cavern, which, as the thawing continues, causes a gradual caving to the surface and a shrinkage in volume of the entire mass.

To drive the thawing points to bedrock a hollow-steel rock-drill cross-type bit was welded to the end of a ¾-in. steam point and a $\frac{3}{32}$-in. hole was drilled at the top of each of the four flutes of the bit. Thus, instead of one $\frac{3}{16}$-in. hole at the end, as in the old point, there are five holes, four in the sides and one in the end, and as a result it is possible to drive the point directly through a boulder. A frozen boulder when partly drilled through expands from contact with the hot water and splits, allowing the point to drop below to the next boulder. Meanwhile the hot water has a sluicing effect from the four side holes, not obtainable with the one orifice only, and thawing proceeds with consequent greater rapidity. Thus in a comparatively short time the entire valley from rim to rim can be thoroughly thawed and a uniform subsidence will take place instead of the scattered pot holes that develop when steam is used.

*Excerpts from "Notes on Yukon Mining Problems," a paper by Henry Mace Payne, presented before the Canadian Mining Institute, March, 1917.

A further advantage of hot-water thawing is the elimination of the possibility of back pressure or suction through the thawing point, with consequent choking by mud, etc., due to steam condensation in the lines, or pressure drop in the boiler.

To facilitate and accelerate driving of the thawing points and to eliminate the use of ladders and chances for breaking points, anvils weighing about 100 lb. may be forged from old dredge-bucket pins, slotted so as to pass over the thawing point, and held in place by a key. Handles may be inserted on each side of the anvil and the helper can turn the point as in regular rock drilling, while the operator standing on the ground alongside strikes with a sledge hammer, driving the point until

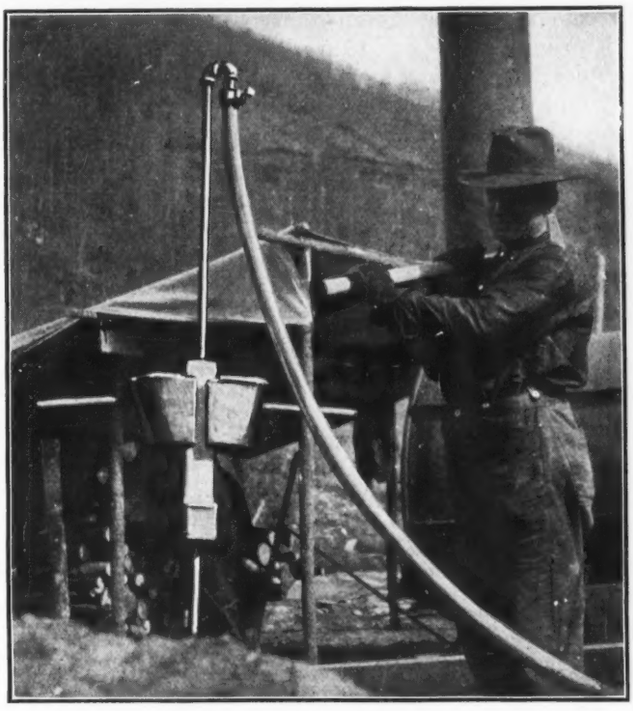


FIG. 2. THAWING POINT DRIVEN TO BEDROCK

the anvil reaches the ground. The key can then be knocked out, the anvil raised to a convenient height, and the driving operation resumed.

The thawing point and anvil are shown in Fig. 2, and a detail of the anvil is illustrated in Fig. 1. In thawing, the points are regularly spaced in triangular relation to each other 16 ft. apart between any two adjacent points. This establishes a fixed distance from the points to the supply line. Rubber hose is used only during driving, after which a standard pipe connection is put on. Between the pipe connections and the main line ordinary railroad-train hose couplings may be inserted, obviating leaky unions and facilitating connecting and disconnecting operations. Two pairs of point men, each equipped with an anvil, can drive five drill-bit points in 10 hours, viz.: Driving, six hours; pulling, 1½; connecting, 1½, and miscellaneous, one hour.

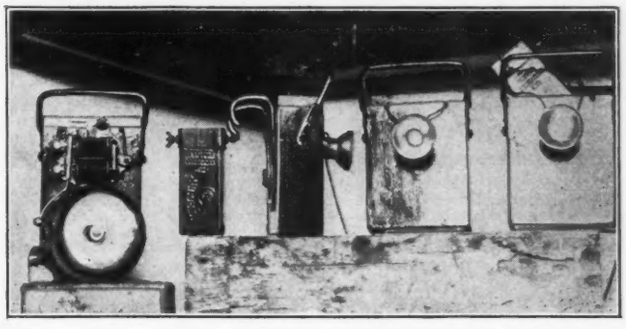
Rapid Tunnel Driving was accomplished during October by the Armstead Mines, Inc., at Blacktail, Idaho, when 488 ft. of 7 x 8-ft. drift was driven in 29 days at its No. 3 tunnel. During 28 days in November, 489 ft. were driven in continuing the tunnel, and the records show an advance of 544.8 ft. made in 31 working days. Two full working days are lost each month when shifts are changed.

Train Alarms and Lights

When cars are being pushed by a locomotive, pulled by a rope, or lowered down a slope, a continuously ringing bell and a red light on the front end of the train are an efficient alarm to warn people off the tracks. Several such gongs and lights are manufactured and are on the market today.

Some time ago I was appointed a member of the safety committee at the mines of the Victor-American Fuel Co., Delagua, Colo., writes Frank Huskinson in *Coal Age*. Realizing the necessity of a suitable "visual" as well as audible warning signal on the trips of cars going up and down the slope, since this same passage is also used as a manway, I made up several trip lights and bells. These are shown in the illustration.

For the trip lamps, a strong wooden box was made large enough to hold a one-cell, two-volt storage battery. This box is fitted with a suitable hanger iron and can be easily hung on the front or rear end of the mine cars, and it also has an iron handle for convenience in placing it on and taking it off the cars. The lamps



STORAGE-BATTERY ALARMS AND LIGHTS

as well as the storage batteries are built from a type of miners' head lamp that has been discarded, in preference to using the more up-to-date Edison miners' safety head lamp. This lamp is fastened to the front of the box, and the globe is colored red. The whole makes an effective "visual" signal on the trips and can be seen at an extremely long distance.

The bell is arranged like the lamp, the same battery and the same size and style of box and hanger irons being used. The bell proper is an ordinary 6-in. electric gong, and it has been found to operate satisfactorily on the one cell.

The combination of a red light and a continuously ringing bell makes an efficient visible and audible warning signal for use on the front end of the trains and complies with the requirements of the law in regard to a suitable warning device to be used on moving trips in a coal mine.

Variations in Transit Needle

Experiments with a Gurley light mountain transit and three magnetic needles showed, according to W. Newbrough in *Engineering News-Record* of Dec. 13, 1917, considerable variation. The instrument was carefully set up and the needle reading set with a magnifier on an even mark of the compass-circle graduations. Another needle was then tried and found to differ in meridian by 30′. A third needle was also tried and

found to differ by 55′. The test was repeated, using each of three pins, and the same result obtained, each needle settling nicely to its own meridian. All the needles were in first-class condition, as were the pins. Setting up over the same point and sighting successively with a Brandis instrument, one made by Berger, and one by Keuffel & Esser, the readings differed in amounts varying from 15′ to 1° 15′. All the instruments were in good condition in every way so far as it was possible to learn from an examination made in the field.

Mining Costs at Corodva, Ontario

BY S. H. BROCKUNIER*

Economical operation at the Cordova gold mine, Cordova, Ontario, under the present conditions of costly labor and supplies, should be of interest. Labor costs were 20% above normal, labor efficiency was only 80% and expense for supplies had increased 50% to 400%. The rock was hard and required no timbering in the stopes. Shrinkage stoping was the method adopted and a hydro-electric plant at the mine made power costs low. The ore was hand sorted at the surface, one-third being thrown to waste. The costs are based on 125 tons of sorted ore per day, derived from 175 tons of rock broken. Working under the shrinkage system of stoping 75 tons was the maximum amount of ore that could be drawn per day for milling, this being the capacity for one shift in the mill. Other stopes, which would have doubled production, were being opened when a fire occurred which destroyed the mill and a large part of the surface plant.

TABLE I. COST OF DRIFTING

	Piston Drill	Hammer Drill
Labor and supplies	16 4-ft. holes per 2 shifts	16 5-ft. holes per 1 shift
Machinemen	$12.00	$3.50
Air	.90	.60
Repairs and lubrication	.80	2.50
Steel and sharpening	1.60	2.00
Track	1.60	2.90
Dynamite	9.60	10.44
Caps	.72	.72
Fuse	.80	.80
	$28.02	$23.46
Cost per ft	7.00	4.69

The driller and helper were required for two shifts' work with piston machines to drill 64 ft. and lay track and pipe. Cost of extra man to lay track and pipe for hammer drill included in its items. Two trammers shoveled back from the drifts and trammed 200 ft. to the ore chutes, thus making the cost of tramming from drifts 17c. per ton.

TABLE II. COST OF STOPING PER SHIFT

Air	$0.80
Machineman	3.25
Repairs and lubrication	.50
Steel and sharpening	1.50
Dynamite	2.80
Caps	.40
Fuse	.45
Carbide	.02
Chutes, etc	2.28
	$12.00

Ore broken, 24 tons; ore sorted, 16 tons.
Cost per ton broken, 50c.; per ton of ore, 75 cents.

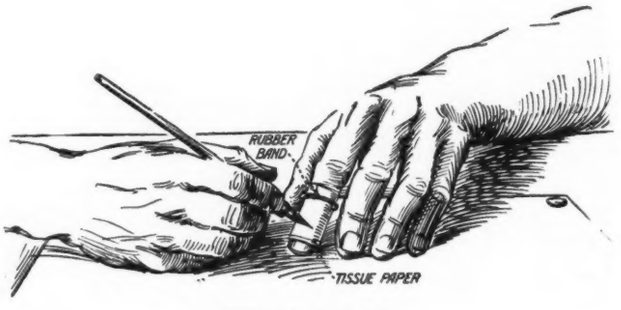
By discarding the piston drills in favor of the hammer type of drifting drills and hollow steel, a reduction in the cost of drifting amounting to $2.30 per ft. was effected. The country rock is hard diorite and gabbro. Drifts and crosscuts are in hard diorite, chlorite schist, or hard quartz—all hard drilling rocks. The vein is 8 to 30 ft. wide and the ore medium to hard drilling. The best speed of the 2¾-in. piston drill in drifting was 40 ft. of hole per nine-hour shift. The average speed of the best hammer types of stoping drill with air at 90-lb. pressure was 1 ft. per 4 min. In drifting it took 16 holes to break a 6 x 7-ft. face. In stoping it took nine 5-ft. holes to break 25 tons. Wages per nine-hour shift were: Machineman, stoping, $3.25; drifting, $3.50; helpers, $2.75; trammers, $2.50; timbermen, $3.50. Supply costs were: Dynamite, 40% (new stock) 20c.; and 60% (old stock) 24c. per lb.; caps, 4½c. each; fuse, 1c. per ft.; steel, 26c. per lb.; rail, 12-lb., $34 per ton; timber, $40 per M.b.m.; carbide, 4c. per lb. The tables provide other details.

Because of the heavy cars and flat grades two trammers were used on each car holding one ton of ore. They were required to shovel from the drifts and tram 30 cars 200 ft. to the chutes per shift. When tramming from chutes they were required to tram 45 cars per shift 200 ft. The cost per ton for tramming was therefore 17c. from drifts and 12c. from stopes. The cost of driving raises was $6 per ft. The total mining cost of development, and stoping delivered to the surface, including office and surface expenses, pumping, power and superintendence, amounted to $1.60 per ton.

*Mining engineer, Nevada City, Calif.

A Handy Penwiper

Draftsmen and users of fine pens with heavy india ink are bothered by dirt and eraser residue getting on the pen. Penwipers are unhandy to use, as both hands are engaged at the moment, so the unsightly habit is formed of wiping the pen on clothing, board or the finger nails of the left hand.



THE PENWIPER

To obviate this a serviceable penwiper is suggested by S. Newman in the *American Machinist* and is shown in the accompanying illustration. A piece of tissue paper is wrapped around the second finger of the left hand and held in place by the thumb or a rubber. It is a handy device and preserves the cleanliness of the draftsman as well as of his pen.

Melting Points of Firebricks

The melting point of a firebrick is understood to be the lowest observed temperature at which it exhibits transition from the rigid to the liquid state. William M. Barr states in *Industrial Engineering* (abstr., *Journ. Ind. Eng. Chem.*) that the melting points of 45 samples of firebrick including fireclay, bauxite, silica, magnesite and chromite brick have been determined in an electric vacuum furnace, the temperature being measured by an optical pyrometer, and the following melting points found: Kaolin 1740° C.; pure alumina 2010°; pure silica 1600°; bauxite 1820°; bauxite clay 1795°; chromite 2180°; magnesite brick 2165° Centigrade.

Rhodesian Mining Operations

Rhodesian mining activities were touched upon by Chairman H. L. Stokes, of Mashonaland Agency, Ltd., which holds an interest in a number of important Rhodesian mines, at the annual meeting in London on Nov. 16. He discussed the companies' mining interests as follows:

"As regards the Wankie Colliery Company, Ltd., the output of coal and coke has continued to increase during the present year, and important additions to the present plant are being taken in hand. The total monthly output of coal from the colliery now amounts to about 50,000 tons.

"The Bwana M'Kubwa Copper Mining Co. continues the production and shipment of copper concentrates, but owing to the prevailing difficulties the board of that company does not see its way at present to order the new plant for the expensive electrolytic process which was decided upon, its decision being influenced, no doubt, by the increased cost of machinery of all descriptions and the necessity to obtain permits for the manufacture of the plant.

"Rhodesia Chrome Mines, in which we have increased our holding to 9500 shares, has made exceptional progress. During that company's financial year ended Jan. 31, 1917, it shipped 87,343 tons of chrome ore, and a still larger output would have been obtained had the carrying capacities of the railway been less restricted. Dividends were paid for the last year amounting to 45%. It has also paid 20% in interim dividends in respect of the current year.

"The Kimberley (Mashonaland) Gold Mining Co.'s mine has for a long time been disappointing at and below the fifth level. At that depth little payable ore has been opened out, notwithstanding careful and systematic prospecting carried out on lines recommended by an eminent geologist. Owing to the ore reserves having considerably exceeded the estimated tonnage, the company still continues to crush and treat about 4500 tons of payable ore per month, and this will probably continue into next year. On the surface developments are being carried out in the recently discovered section of payable ore in the western extension, where prospecting work has opened a continuation of the reef in this direction of 1000 ft., averaging 7½ dwt. over 30 in.

"At the zinc-lead mines of the Rhodesia Broken Hill Development Co., progress has been exceptionally satisfactory. The new plant is now completed, and the two large smelters (blast furnaces) are in full work, producing metallic lead at the rate of about 1000 tons a month. It is not unreasonable to assume that there is a possibility of a great industry being built up in course of time.

"A substantial holding has been acquired in the Rhodesian and General Asbestos Corporation, a new company registered in Rhodesia with a capital of £400,000 (£30,000 working capital). This company has been formed to amalgamate various valuable and proved asbestos properties situated in Victoria, Belingwe and other districts in Southern Rhodesia. The properties acquired have been developed and are equipped with sufficient plant for the production of asbestos on an extensive scale. Regular outputs are being produced and sales effected at prices which should yield good profits.

"Touching for a moment on the general conditions of Rhodesia, these have not suffered from the adverse influences of the war so much as might have been expected. The output of gold and other products has been fairly maintained and in some cases increased, notwithstanding greater costs of stores and materials. This result is the more noteworthy when we remember that so large a proportion as 40% of the adult white male population have answered the call to arms. There is now encouragement for anticipating in the near future developments on a large scale in the outputs of base metals already alluded to, such as copper, lead and possibly zinc, which, in their turn, will create increasing demands for coal and coke. These matters, together with the thriving asbestos business, promise to become industries of great importance and value to the future development of Rhodesia."

Progress in Developing Alaska Coal

The great demand for coal lends additional interest to the report that some progress is being made in opening up Alaskan coal deposits in advance of the beginnings of railway operations on the Government line to the Matanuska district. The Alaskan Engineering Commission states that it has opened a mine near Chickaloon, just north of the Matanuska River, to supply the incomplete railway, and made the first shipment of coal Oct. 29. A tract of 1140 acres in the same district has been leased to a company of Oakland, Calif., men, and equipment is on its way there. Two mines in the lower Matanuska field have shipped about 40,000 tons in the last year. Land in the Tenana lignite field is soon to be offered for lease. It is expected that when the railroad begins operations next season enough coal will be shipped out to supply the railroad, the Pacific fleet, and all other Government needs on the Pacific coasts. Already Portland and Seattle are beginning to look hopefully toward a supply of Alaskan coal for ships, manufactories and domestic needs. It is the best on the coast for steam, blacksmithing and coking, and the present shortage of fuel makes it more in demand than ever.

Oil in Big Horn Basin, Wyoming

The south half of Big Horn Basin, Wyoming, embraces some oil country that is undeveloped but promising. A report[1] recently published by the U. S. Geological Survey presents information regarding 50 domes and anticlines in this region. Besides the Greybull, Torchlight, and Grass Creek anticlines, which are already sufficiently developed to contribute largely to the production of oil in Wyoming, there are several other domes and anticlines in which oil or gas has been struck but which are not sufficiently drilled to indicate their value as oil reservoirs. Eleven of the anticlines described have already proved to be productive, and about as many more anticlines have been tested by one to four holes, though some of the holes have not been theoretically well placed. Oil development in Wyoming is still in an early stage, and drilling has not yet covered enough ground to indicate the probable productivity of all the anticlines.

[1]Bull. 656, by D. F. Hewett and C. T. Lupton, U. S. Geological Survey, Washington, D. C.

Wolframite Ore in South China

A development of interest in the Canton district has resulted from the growing demand for wolframite ore, and the recent discovery of this mineral in Kwangtung Province in southern China. Consul General P. S. Heintzleman, writing from Canton, under date of Sept. 10, 1917 (*Commerce Reports*, Nov. 7), says: "Little reliable information on the occurrence and production of wolfram in this district is obtainable. This is not surprising, as the discovery of the ore was made only recently, and the mining bureau has had few applications for mining rights covering this material. The natives and even the official deputies mistook it for manganese or iron ore, until the high prices offered raised a suspicion that it must contain something different from the commoner metals. The Japanese first learned of the value of the 'iron ore' in Hunan Province, and offered about 17c., gold, a pound for it. Other buyers learned of the bargain, and offered better prices. Now average ore brings about 32c., gold, a pound at Canton.

Ore from Kwangtung and Adjacent Provinces

"Much of the ore comes from Chengchow, Hunan Province, adjacent to the border of Kwangtung Province. It is transported on human shoulders from the mine southward to Ping Shek, Kwangtung, a distance of about 60 miles. From here it is carried in small junks down the North River to Shiuchow, an additional distance of 80 miles, whence it is brought to Canton over the Yueh-Han railway. All the mining is done by hand. Production and transportation costs are not made public. Many anxious buyers, not waiting for the ore to reach Canton, have established headquarters at Lok Chong, a small town on the west bank of the North River, 40 miles above Shiuchow, where they are able to intercept the cargoes, and get first choice from the middleman who has bought up the ore. The middleman daily collects the goods direct from the miners in varying small amounts.

"Several places in Kwangtung are said to produce wolfram ore, but since investigation by the Provincial Government is so limited, and the differentiation of minerals by the natives so unreliable, the importance of these finds must be confirmed by experts. Several, however, are positively known to produce the valuable ore. The Fu Min Co. has a claim at Waichow, on the East River. The corporation permits the natives to mine in the concession, but insists on the exclusive right to buy the product. The current price paid for the ore to the miners is about 20c., gold, per lb., and the company obtains about 32c. at Canton. The number of miners engaged in this enterprise is said to be upwards of 1000. The method of mining is principally hand placering. The miners dive for the sand and wash it for the heavy ore. The ore runs from mere dust to the size of walnuts or larger. Again, it is found on the hillsides, where it is dug and washed in the usual manner. No proper study of the mode of occurrence of the ore or the geology of the country has been undertaken and little can be said on these subjects. A small sample of the ore from the Waichow district was analyzed recently by a qualified mining engineer and chemist. The ore was found to contain 55 84% tungsten, 13.25% iron, 11.56% manganese, and the rest in calcium, magnesium, etc. This sample gives a general idea of the nature of the ore.

"Haifong district has been reported to produce wolfram ore, but no actual mining has begun there. Official deputies were sent recently to survey the places, the names of which are still kept from the public. Kwangsi Province also is said to produce wolfram ore. A Chinese company, while prospecting for antimony ore some time ago in Kwangsi, found small seams of wolfram in the Hochi district, 120 miles northwest of Liuchowfu. The ore occurs in hard quartz, and the cost of mining is excessive. The work there is now suspended."

In September, 500 Tons Awaited Export

Of the production of wolframite in South China, George E. Anderson, Consul General at Hongkong, reported on Sept. 13:

"The course of the trade in tungsten in Hongkong, since the development of the South China fields commenced this year, may be shown by the fact that the exports from Hongkong in June amounted to 60 tons, in July to 78 tons, and for the first half of August to 92 tons, permits to ship to the United States being withdrawn about the middle of August. There is now on hand in Hongkong and Canton warehouses perhaps 500 tons of the ore ready for sending to the United States as soon as permission from the British government covering trans-shipment at Hongkong can be obtained.

"The ore so far shipped has been obtained almost altogether from surface pockets or deposits in the hills of Kwangtung Province, particularly in the North and East River country. It has been gathered in characteristic Chinese style—a litle here and a little there and without regard to the origin of the pockets or the possibility of developing veins or strata of ore-bearing rock. The actual limits of the field, accordingly, are not clearly defined. On the other hand, the deposits so far found and worked are so widely scattered that there is every reason to believe that the actual ore to be obtained from the field is of large amount. The ore varies considerably in quality and, as the pockets now known are worked, there seems to be a slight falling off in the percentage of tungsten. However, most of the buyers on the ground are justified in anticipating large returns from the field."

Bureau of Mines May Study Lignites

Secretary Lane has recommended to Congress an appropriation of $100,000 to enable the Bureau of Mines to investigate the commercial and economic practicability of utilizing the lignite coals of the United States for producing fuel oil, gasoline substitutes, ammonia, coal tar and gas for power. There are immense quantities of lignite in the public lands of the country, but the coal does not stand transportation in its natural state and is of small value for fuel except near the mines. If a satisfactory method of extracting fuel oil and other substances be secured, it would add immensely to the resources of the United States.

Indications of Cobaltite and Smaltite in Lemhi County, Idaho, have been examined by the U. S. Bureau of Mines. It is in this district that Elwood Haynes, of Kokomo, Ind., is erecting a mill in the hope of securing a domestic supply of cobalt for use in the manufacture of stellite.

Events and Economics of the War

Control of railroads in the United States by the Federal Government, as a war measure, became an accomplished fact at noon on Dec. 28, when Secretary of the Treasury McAdoo, by appointment of the President, took office as Director General of Railways with practically unlimited power as to control and operation. Mr. McAdoo immediately ordered that all traffic should be moved by the most convenient and expeditious routes. Congress, continuing its inquiry into the conduct of the war, was informed by Quartermaster-General Sharpe that half of the uniforms ordered were still undelivered. The President gave to the press the report of Food Administrator Hoover refuting the charge of Claus Spreckels and others that the Sugar Committee was favoring the "sugar trust." Announcement was made that, beginning Feb. 4, all unnaturalized German males more than 14 years old must record data concerning themselves and their photographs and fingerprints. At San Francisco, 15,000 foundry workers have demanded higher wages.

At Brest Litovsk, peace terms favoring Germany and based largely on the *status quo ante* were proffered the Bolsheviki by Count Czernin, acting for the Central Powers. The move is regarded in Allied countries either as a "feeler" or as an attempt to breed dissension among the Western Allies. Bolsheviki at Harbin, Manchuria, were defeated by Chinese troops, who occupied the town. French troops took Austrian positions at Monte Tomba on the Italian front, with 1400 prisoners. German attacks failed at Verdun but resulted in small gains at Cambrai. Admiral Wemyss succeeded Admiral Jellicoe as head of the British Navy; three British destroyers were sunk by mines or torpedoes off the Dutch coast. In Guatemala, a series of earthquakes lasting two days practically destroyed Guatemala City.

Railroads Taken Under Federal Control

By proclamation of President Wilson the Federal Government took possession at noon on Dec. 28 of all railways in the continental United States that are engaged in general transportation. The control and utilization of the roads are to be under the authority of William G. McAdoo, who has been appointed and designated Director General of Railroads. Mr. McAdoo will not resign as Secretary of the Treasury. Under his direction are also placed all auxiliary water lines, terminals, warehouses, telegraph and telephone lines and all other agencies commonly used in operating the systems. Secretary McAdoo's powers are unlimited under the wording of the proclamation. He may perform his new duties "so long and to such extent as he shall determine through the boards of directors" of the various companies. The various systems are to remain subject to all existing statutes and orders of the Interstate Commerce Commission and of the various states, unless the Director General shall otherwise rule. Any orders made by the latter are to have paramount authority.

Remuneration for the use and control of the properties is to be made to the owners "on the basis of an annual guaranteed compensation above accruing depreciation and the maintenance of their properties, equivalent, as nearly as may be, to the average of the net operating income thereof for the three-year period ended June 30, 1917. . . . Regular dividends hitherto declared, and maturing interest upon bonds, debentures and other obligations, may be paid in due course, and such regular dividends and interest may continue to be paid until and unless the said director shall from time to time otherwise by general or special orders determine, and, subject to the approval of the director, the various carriers may agree upon and arrange for the renewal and extension of maturing obligations."

The President's proclamation further provides that no attachment by mesne process or on execution shall be levied on or against any property used by the systems in conducting their business as common carriers, except on the prior written assent of the Director. However, suits may be brought against them and judgments rendered, as hitherto, unless the Director shall otherwise determine. Control of the roads passed to the Government at noon on Dec. 28. For accounting purposes it is to date from midnight Dec. 31, the beginning of the railroads' fiscal year. Right is reserved in the proclamation to take over at a later date all street and interurban electric railways, including subways and tunnels.

The personnel of the Director General's official board is as follows: John Skelton Williams, Controller of the Currency; Hale Holden, president of the Chicago, Burlington & Quincy R.R.; Henry Walters, chairman of the board of directors of the Atlantic Coast Line; Edward Chambers, vice president of the Santa Fe railroad and head of the transportation division of the U. S. Food Administration; Walker D. Hines, chairman of the executive committee of the Santa Fe and assistant to the Director General of Railways. Upon assuming office, Mr. McAdoo immediately ordered that all freight be moved by the most direct and expeditious routes. This sweeping order was followed by the resignation of the Railroads' War Board, the members of which, with the exception of Hale Holden, hastened to return to their various railroad headquarters to supervise the carrying out of the Director's order. Director McAdoo is taking steps to relieve the serious coal shortage existing in New York and New England.

John F. Stevens at Nagasaki

John F. Stevens, chief American railway commissioner to Russia, arrived at Nagasaki on Dec. 19, from Vladivostok. He took the accommodations of an entire hotel in Nagasaki for the 320 members of his staff. In a statement to the Associated Press Mr. Stevens said that he fully expected to return soon to Russia to continue the

work of reorganization of Russian rail communications. He denied the report that he was returning to America and said:

"The demand on America by the European war front is important, but the Russian situation is trebly important, as it involves the return of a million and a half German and Austrian effectives and gives unlimited possibilities to the German organization of Russia's resources and man power.

"Russia at present presents a completely chaotic condition, permeated by the most clever German propaganda in every way and everywhere among all classes of the people. Nevertheless, I believe the better judgment of the mass of the people will be asserted, and Germany will not succeed in forcing a separate peace. Such a peace cannot be concluded if the Allies promptly give their help and suggestions."

Save the Coal

The U. S. Bureau of Mines recently asked the advice of a number of prominent fuel engineers throughout the country as to the best way to conserve coal during the war. Martin A. Rooney, of Detroit, Mich., replied:

"In every trainload of coal laboriously hauled from the mines to our coal bins, one carload out of every five is going nowhere and worse. In a train of 40 cars the last eight are dead load that might better have been left in the bowels of the earth. Every fifth shovelful of coal that the average fireman throws into his furnace serves no more useful purpose than to decorate the atmosphere with a long black stream of precious soot. These are not meaningless statistics nor a 'Goblin' story, but cold facts on a warm subject. At best, one-fifth of all our coal is wasted.

"And it is shamelessly and needlessly wasted. Instruments and machinery for getting out all of the heat there is in it are not nearly so complicated nor expensive as the cash register which keeps tab on cash receipts or the truck which clips a few cents off delivery costs. Carbon dioxide, temperature and draft are easier subjects to comprehend than bank discount or freight rates.

"The moral is, Mr. Coal User, get busy and learn what they are and how to use them. The time is coming when the Government is going to limit the amount of coal that is dumped down the chute, and in the name of fairness, when fuel must be denied a manufacturer, let it be to him who cannot show that he is going to use it efficiently. In the name of fairness to the miner who digs it, in fairness to the heavily burdened railroad which transports it, in fairness to a number of people whose existence and whose future happiness depend absolutely on the use made of this most precious of resources, let every one make efficiency the criterion when judging which industrial establishment shall survive.

"In fairness to the manufacturer who is patriotically operating his properties at nearly to the breaking speed and who is giving up a large part of his profits for the general good, let the Government show him how to conserve this most important of his raw materials. Let every one send in to the furnace and boiler rooms men who can show firemen how to burn fuel with the least waste, just as experts have been sent among our fields and orchards to show the farmer how to increase the productivity of his soil."

President Thwarts Reed's Attempt to Discredit Hoover

Publication of Food Administrator Hoover's statement on the sugar situation which the Senate investigation committee had refused to record was authorized by President Wilson on Dec. 25. The action of the committee in refusing to hear Mr. Hoover's side of the case promptly roused the ire of the President, says the *Sun*, who held that his answer should be placed before the country while the charges made against his administration of the sugar supply were fresh in mind. The chairman of the committee is Senator "Jim" Reed, one of the chief objectors to Mr. Hoover's appointment.

The statement contains the Food Administrator's reply to charges made before the committee by Claus Spreckels, president of the Federal Refining Co., that the sugar situation was mismanaged, and sets forth in detail the Administration's efforts to keep sugar prices down while supplying large quantities to the Allies. The committee not only had refused to make the statement a part of the Congressional record, but had declined to permit Hoover to take the stand to answer Spreckels' charges. The President's action is considered in the light of a vindication of Mr. Hoover and somewhat of a rebuke to the committee.

After reviewing the sugar market conditions of the world from the time the Food Administration was organized, Mr. Hoover's statement recites the difficulty met in obtaining coöperation among the various sugar interests. The price in many parts of the country went from 8½c. to 10½ and 11c. But the Food Administrator adds that without Government supervision the price might easily have gone to 25 or 30c., with a cost to the public of $200,000,000 in four months. He attributed the sugar shortage to the fact that this year the Allies have taken 1,400,000 tons of sugar from the Western Hemisphere, whereas they normally take only 300,000 tons.

In discussing the regulations promulgated by the sugar division of the Food Administration, he says:

"I do not contend that they could not have been more efficient. They are as efficient as they could be with the feeble weapon of voluntary agreement that we have been able to wield. Had the right not been stricken out of the food bill for us to purchase sugar directly for the Government, both the price and the distribution could have been handled more efficiently."

Army Trucks Finish Test Run

Twenty-nine three-ton auto trucks which left Detroit on Dec. 14 arrived at Baltimore on Dec. 28, having covered 600 miles. Allowing for three and a half days when they did not travel, it is estimated that the trucks made about 50 miles a day. The success of the run proved the practicability of moving the trucks by their own power over long distances, thus relieving the railroads of the necessity of carrying them. Capt. Bennett Bronson was in command of the trucks, with First Lieut. L. J. Ward as medical officer and Second Lieut. C. A. Riley in charge of 80 soldiers. No direct comparisons have been made as to the cost of transporting material by auto trucks and by railroad. It is said the Government will move supplies by truck over long distances.

Inefficiency in War Department Proved at Inquiry

Investigations by the Senate and House committees have revealed inefficiency in the War Department in contrast with efficiency in the Navy; they have also shown that the Shipping Board and Emergency Fleet Corporation have made good progress in view of the existing labor conditions. There had been complaints of interference, red tape, and changes in specifications in the matter of building ships, all of which, it was claimed, had delayed the program. It was developed on the stand, however, that Chairman Hurley of the Shipping Board had brought in some of the best production experts in the country, and in order that he might do so trustees of the Emergency Fleet Corporation had changed the by-laws so as to give Hurley supreme authority. Previously the general manager had such authority as would make the president of the corporation a mere figurehead. Production has improved since Hurley took charge.

It developed at the shipping hearing that an entirely new industry had to be created to meet the condition wherein the Navy had contracted for 70% of the space in well established yards, while remaining space was occupied by merchant ships. Whereas there were 58 yards in existence when the Emergency Fleet Corporation took hold, there are now 132. The great problem has been to train labor for these new yards without taking men from the well-established ones.

The House committee's investigation of the Navy gave Secretary Daniels and Rear Admiral McGowan, the paymaster general, an opportunity to show how expansion of the Navy has been carried on without shortage or friction. On the other hand, the Senate Military Affairs Committee has uncovered great weaknesses of the War Department, especially in the ordnance and quartermaster's departments. Apparently the expansion of the army was too great for the administrative ability of the personnel in charge. There is an admitted shortage of clothing and supplies, and of guns and ammunition.

Over Half Million Working Days Lost in Building Ships

Strikes in various shipyards throughout the country have caused the loss of 596,992 working days, delaying to a corresponding extent the Government's wartime ship-building program, according to a statement before the Senate investigating committee by Raymond B. Stevens, a member of the U. S. Shipping Board, who has been particularly concerned with the labor situation as it affects the building of cargo boats for the Government. The loss is equivalent to that caused by a 30-day strike of 20,000 men. Most of the strikes have been for more pay and shorter hours, though some have been over the question of the closed or open shop. In order to keep the men steadily at work the Shipping Board has thought it expedient to grant a 10% wage bonus for a six-day week. The bonus will become a part of the regular wage of the men so engaged on Feb. 1. According to Mr. Stevens, much of the industrial difficulty encountered has been due to the impression among workmen that contractors are making fat profits out of the contracts for building ships.

Niagara Power Requisitioned

To assure an adequate supply of electric power for establishments engaged in war work at Niagara Falls and Buffalo the Government requisitioned on Dec. 28 the electric power produced, imported, and distributed by the Niagara Falls Power Co., the Hydraulic Power Co. of Niagara Falls, and the Cliff Electrical Distributing Co. Canadian demands that approximately 100,000 hp. of current imported from the Canadian side be applied exclusively to war work were said to have been a factor in the Government's action.

The operation of mills is not expected to be affected materially by the new order, as a readjustment of the power supply had been effected previously by representatives of the War Industries Board conferring with the Buffalo manufacturers. Approximately 110 factories not working directly on war contracts will curtail their electric-power requirements somewhat and will use power at times when munitions factories are making their smallest demand. They will also substitute steam for electricity as much as possible.

May Electrify Great Britain To Save Coal

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The universal electrification of all Great Britain, including the railroads and all factories, is the gigantic project promulgated by the Coal Economy Committee for the reconstruction commission and announced by the Minister of Reconstruction. It includes the use of electricity for domestic purposes.

It is proposed to consolidate all the electrical establishments of the United Kingdom and create 16 gigantic central super-power stations of 20,000 to 50,000 hp. each, supplying their districts through trunk lines. It is calculated that this project would save $500,000,000 in coal annually and would end the notorious London smoke. . . .

An immense cheapening of power is promised, resulting in the greater employment of mechanical power and an increase in the industrial output. The commission finds that America employs nearly twice as much power per workman as Great Britain, which explains the greater American production per capita.

Sailing Vessels for Nitrate Trade

Between 400 and 500 sailing vessels are to be used to bring nitrates from Central and South America to the United States, and nearly all the steam vessels now being used for that purpose are to be released for transatlantic service. The sailing vessels are being procured by Secretary of Commerce Redfield in response to an appeal from the Secretary of War. The only objection that has been voiced regarding the use of schooners is their lack of speed. Secretary Redfield points out, however, that there will be no delay once a steady stream of schooners begins running to and from South American ports and the United States. Arrangements will be made for convoys, and the vessels will operate at a minimum of risk. Deliveries of 100,000 tons of Chilean nitrate purchased through the War Industries Board for sale to American farmers at cost will probably begin this month. The price will probably be approximately $75 on board cars at the seaboard.

Industrial News from Washington

BY PAUL WOOTON, SPECIAL CORRESPONDENT

Steel Prices To Remain Unchanged During First Quarter

By limiting contracts to the first quarter of 1918, it is believed that the President's latest order concerning steel prices will have a very disturbing influence on all construction, which extends over a greater length of time. The order presages a revision downward of steel prices for the second quarter, many believe. Producers of iron ore had expected that an increased price would be allowed them at this time. They ascribe the failure to grant them a higher price to the short time that had elapsed since they submitted important data as to costs. When officials have taken time to assimilate these data fully, it is believed that the justice of a higher price will be recognized. Ore producers fully expect to receive a higher price in the April adjustment. The text of the order issued from the White House on Dec. 28 follows in full:

The President today approved the recommendation of the War Industries Board that the maximum prices heretofore fixed by the President upon the recommendation of the Board upon ore, coke, pig iron, steel and steel products, subject to revision on Jan. 1, 1918, be continued in effect until Mar. 31, 1918. No new contracts calling for delivery of any of said commodities or articles on or after Apr. 1, 1918, are to specify a price unless coupled with a clause making the price subject to revision by any authorized U. S. Government agency, so that all deliveries after that date shall not exceed the maximum price then in force, although ordered or contracted for in the meantime. It is expected that all manufacturers and producers will observe the maximum prices now fixed.

France Declines Aid in Mining Coal

Official notice has been received from France that it will not be possible at this time to utilize the proffered assistance of American miners in the rehabilitation of French coal mines retaken from the Germans. The reason given is the fact that only a small portion of the coal-producing area has been yet regained.

While no mention was made in the communication of other reasons for declining the assistance offered, it is understood that the French government feared that it would be difficult to make the public in the mining regions understand why Americans were being used in the mines, rather than at the front. Moreover, the payment of the American standard of wages would give rise to dissatisfaction among the native miners, whose rate of pay is much less.

Occurrence of Lode Deposits Near Nenana Coal Fields

Active prospecting of lode deposits near the Nenana coal fields of Alaska is predicted by R. M. Overbeck, of the United States Geological Survey, as a result of extending the Government railroad thither. While gold will be the principal mineral sought, antimony, iron pyrite, chalcopyrite and bismuth are known to exist in this region and probably will receive attention from prospectors. Mr. Overbeck points out the following four geologic facts which should be carefully noted by one engaged in prospecting for lode deposits in this region: The deposits occur in the schist; they are associated with the fine-grained dark schist, are near small acidic intrusive bodies and are related to faulting.

Manganese Exports from Brazil Increase in 1917

From 245,185 metric tons in 1914, exports of manganese ore from Brazil increased to more than 500,000 tons in 1917, the advance in 1916 continuing through 1917. The exports in 1917 have been even greater than those in 1916 with the exception of one month. Shipments in October, 1917, were 60,188 metric tons, a larger amount than had been exported in any other single month. Following is a table showing the gradual increase of manganese shipments from 1914 to 1917 as compiled by the American Consul General at Rio de Janeiro:

EXPORTS OF MANGANESE ORE FROM BRAZIL IN 1914–1917

Months	1914 Tons	1915 Tons	1916 Tons	1917 Tons
January	26,468	26,735	36,025	39,843
February	17,510	22,915	32,780	37,505
March	20,510	24,587	31,441	40,700
April	16,172	24,690	34,675	46,659
May	21,058	25,138	29,400	38,747
June	26,785	20,295	37,040	51,037
July	22,720	19,060	40,394	39,158
August	14,960	21,100	40,639	58,758
September	12,450	28,330	36,338	45,059
October	21,075	30,370	40,099	60,188
November	19,620	30,635	35,940	.....
December	25,857	36,025	37,654	.....
Total	245,185	309,880	432,425	457,654

The manganese producing district is connected with the coast by the government-owned Central Railroad of Brazil. The line is narrow gage and is approximately 300 miles in length.

Examining Caliche in California

Promising reports as to the value of a *caliche* deposit in southeastern California, as a source of nitrate, have caused the U. S. Geological Survey to send a corps of specialists to examine it and to make thorough tests. The relation of the *caliche* to the underlying Tertiary formation is to be investigated. The work is in charge of Hoyt S. Gale, assisted by G. R. Mansfield, L. F. Noble, G. C. Caukins, F. H. Chapin and a force of practical prospectors. The expedition is accompanied by a chemist equipped to make rough nitrate determinations.

Testing Copper-Nickel Ores of Alaska

In the hope of finding a way of making the nickel in the copper-nickel ores of Alaska commercially available, laboratory tests have been begun by the United States Bureau of Mines. The importance of nickel as a war mineral and the fact that but little of it occurs in the United States, proper, are causing increased attention to be paid to this metal by the Bureau of Mines and the Geological Survey.

EDITORIALS

WALTER RENTON INGALLS
Editor

MCGRAW-HILL COMPANY, INC.—JAMES H. MCGRAW, *President*

Government Railway Operation

AT NOON, Dec. 28, the Government assumed operation of all the railways of the United States by proclamation of the President, who appointed William Gibbs McAdoo, Secretary of the Treasury, to be Director General. The railways are to be guaranteed the same net earnings as the average for 1914-16, their obligations are to be met and their financial needs are to be supplied. A part of this program requires legislation by Congress, which will defer to the President's engagements and wishes, it is expected, and there remain details to be worked out, respecting which nobody is alarmed, for there is a general recognition of the President's attitude of fairness toward all parties, including the railway stockholders and bondholders. In effect the Government guarantees bond interest and dividends on stocks during the period of the war, and thus is removed the great fear of investors, who saw the railways being crushed between an upper and a nether millstone.

There is a general feeling that, the Government having taken this step, there will never be any return to the old system of individual, competitive operation. Whether the result will be Government ownership or something less than that remains for time to tell. What we may now recognize is simply that our old railway system is passing, just as passed the turnpike system of a former time. The fundamental reason is similar. The public will not consent to private control of its means of transportation.

The unification and coördination of the railways should theoretically result in an enormous economy. This was foreseen by railway operators as early as 20 years ago. They took steps in that direction, but were promptly checked by public opposition, which expressed itself in restrictive legislation and executive impediments. Then began the crushing of the railways between popular opinion on the one hand and the demands of unionized labor on the other hand. The people have now got what they wanted, or thought they did, and at the same time the Government has recognized that the theory of the railway operators was right. Perhaps was never denied that it was right. The point was rather whether the railways were to get the benefit of the saving, or the people. The people think that they are going to get it, and during war-time it may be so, nay, probably will be so, for the railways are going to be run by their old operators, and, still free from the blight of politics, they will be able to effect the immense economies that they themselves foresaw. Of course, the improvement is not to exhibit itself overnight. The job of reorganizing the railway transportation of the whole country is too stupendous for immediate results, but with the lapse of reasonable time the elimination of what is now waste, either owing to the duplication of work or the performance of unnecessary work, is surely going to return to Treasury a surplus after the railway bondholders and stockholders have been paid for the use of their property what they have been guaranteed.

Naturally, much depends upon the good faith of the labor brotherhoods, which is now going to be tested. If their claim be correct that their wages have not advanced in proportion to the rise in the cost of living, without any doubt they will be granted what is right, and the public will be required to pay higher rates for transportation, which it ought to do cheerfully. If, on the other hand, the claim of the brotherhoods be incorrect, they will have to recognize that they are now confronting the people, instead of a group of corporations toward which the people were surly and suspicious. The correct policy for the brotherhoods now is to be reasonable in their demands and to see to it that their members be efficient in their work.

The possibilities for economy in the railway amalgamation that unfold themselves are so stupendous that they seem too good to be true, nor must we expect that we shall realize the maxima of all of them. During the period of war we may expect a high degree of efficiency, although we shall have to put up with many discomforts, in that respect paying the penalty of the starvation of the railways at the behest of popular clamor during the last 10 years. Such troubles are going to be particularly acute in certain parts of the country, New England for example, where the railway systems have been wrecked by legislative and judicial procedure, which took them out of the hands of the banking administrations that were developing just such a policy as the Government has now adopted.

But when we begin to think of what may be after the war, we begin to see the subtractions from maximum economy that may ensue. We may conjecture how theoretical economy may be offset by slothfulness of hand and sluggishness of intellect. We dread lest the kind of bungling that characterizes the postal administration may spread to the railways. The railways have heretofore been run by a staff of $10,000 to $50,000 men. The Government uses $3000 to $5000 help. From the standpoint of industrial managers the railways have not in recent years been run with the smartness and intelligence that other engineers are used to, but as compared with what the Government does they have been as the hare to the tortoise. For example, the railway stations of the country are less dirty and evil-smelling than the post offices, and we fancy that trains are more on time than mail deliveries. We shall not have such comfortable and speedy passenger trains, for the incentive of competition to secure business will be gone. The new mining district that needs a railway extension may not have so easy a time in getting it as when it was solely a matter of private enterprise and interest. It may be that the people will not like what they have thought they wanted. Meanwhile, the amalgamation of the 250,000 miles of railway of the United States as a war measure was the only thing to do.

The Wages Problem

IN A RECENT number of *Commerce and Finance*, Justus F. Mozart, a Chicago workingman, contributes a very reasonable article on the wages problem, offering an ideal solution and asking if it be practicable. Condensing slightly, he says:

We do not labor eight or ten hours a day to get a certain amount of money. No, we want food, shelter and clothing—and, performing the same amount of work every day, we should be entitled to the same amount of food, shelter and clothing every day. But we do not get that, because the prices of the necessaries of life are based on the wages instead of the wages being based upon the prices of the necessaries of life. We workingmen, of course, put up a stubborn fight to keep in the race. Most of the time we lose, but sometimes we win. If we sometimes succeed in getting an increase in our wages the real benefit accruing to us is never so great as it may seem. As a general rule we seldom get an increase without resorting to strikes, which means a total loss of any income whatever. And strikes cause bad feelings between employer and employee—and oftentimes bloodshed and destruction of valuable property; and this is beneficial to nobody. The present system of settling disputes between capital and labor is not endurable any longer—neither to the capitalist nor the working class. Arbitration has failed in all other countries where it has been tried. It will fail here. But one thing which has not been tried anywhere, and which once forever will settle this class war between capital and labor, is to base the wages upon the prices of the necessaries of life. Every man should be given an index salary and by multiplying this with the index price for food, shelter and clothing we would arrive at the workingman's weekly wages. In other words, the burden of a proper supply and distribution would be placed where it properly belongs—on the shoulders of the capitalist class. This class is highly organized, has all the brains and all facilities successfully to check any attempt to tamper with the supply and distribution of the necessaries of life.

This suggestion looks toward the equality in the distribution of wealth that is the great desideratum. If wage earners never felt the pinch of the increasing cost of the necessaries of life without doubt there would be a diminution of labor troubles. If employers appreciated better the workings of economic law there would be more voluntary increases of wages; and, on the other hand, wage earners would be more reasonable about reductions when they became necessary. Without any doubt wages adjust themselves to the cost of living in the long run, but the adjustment is clumsy and confused, and conditions are apt to be temporarily inequitable.

The reason for this is also the reason why a fixing of wages according to index numbers is impracticable. The index numbers themselves are but rough approximations even of the composite price of commodities. They do not include rents and other elements of the cost of living at all. Being a composite, they involve factors that exhibit at times wide discrepancies, and also there are differences among several parts of the country, although in any general price movement of major character the tendency is for these discrepancies and differences to disappear. This, together with other reasons, points out why no index number could feasibly be introduced as a factor in fixing wages week by week or even month by month.

Somewhat similar to this idea is that of a sliding scale for wages according to the price received for the commodity produced, which was introduced a few years ago in copper mining, and apparently with a good deal of success, especially when the price for copper was generally rising. However, when the price for copper started downward, while the general index numbers were still going up, there was trouble.

The idea as to the relation that there ought to be between wages and index numbers is probably correct to this extent: If the index numbers over a series of years show a certain trend and if the average rate of wages has failed to move correspondingly, the demands of labor on the ground of increased cost of living ought to be examined carefully and not be resisted on the general principle that labor must fight for any advantage. As we have remarked previously, wages conform to index numbers in the long run. But in the view that is even longer they gain upon them, for all progress in are arts inures eventually to labor; that is, its share of production becomes greater, which means that its standard of living rises. The organization of the petroleum industry, the invention of the telephone, the mechanicalizing of manufacturing, and all such advances in the arts have been to the ultimate benefit of labor.

Russia

THE reports of the Anglo-Russian mining companies that have lately been holding their annual meetings in London give us a better idea of the situation in Russia than we get from the press dispatches, which are confined mainly to the doings of the Bolsheviki in Petrograd and Moscow. Work is still going on at their properties, although in a more or less crippled way, and we get the impression that in the vast stretches of Russia there is relative quiet as compared with the chaos in the capitals. In the addresses of the chairmen of these companies there is a certain note of optimism, while the seriousness of the present situation is not minimized, nor even is there any attempt to disguise the opinion that possibly it may become worse before it begins to get better. All agree that the revolution must run its course.

To the student of history there is a wonderful similarity between the events of the French Revolution and the Russian. The main differences, so far, seem to be that the sequence of events in Russia has been swifter and there has not yet been exhibited the same ferocity. In both cases the causes were economic. In both cases the struggle became a war between classes. There was demoralization of the army of France, just as there has been in that of Russia, but, nevertheless, external wars continued to be prosecuted. Early in 1793 the disorder in France was such that when the Germans invaded the country many expected a quick and triumphal march to Paris, but the French rallied and by the end of the year they achieved signal military successes against the enemy. Intoxicated by the victories, the revolutionary convention abandoned itself to the fervor of conquest.

In France as well as in Russia the control of affairs passed gradually into the hands of the worst elements—the Jacobins in France, who may be compared to the Bolsheviki in Russia. The political measures of the Bolsheviki, their financial mismanagement, their enactment of impracticable laws dictated by passions, simply repeat what the Jacobins did in 1793-94. The ideas of the leaders were singularly similar. Robespierre finally, like Lenine, found himself free to establish the republic of virtue. He sketched the plan of an ideal society in which every man should have just enough land to maintain him; in which domestic life should be regulated by law and all children should be educated by the state,

the nation to be ruled by a dictator while bringing this about. This fantasy sounds much like Lenine and Trotzky, does it not?

The Fall of the Bastille occurred July 14, 1789. On Apr. 5, 1794, after the execution of Danton, there was none to dispute the leadership of Robespierre. The Russian revolution, dating from Mar. 15, 1917, proceeded so far as to have Lenine and Trotzky on Nov. 7, 1917. Assuming that Robespierre is the prototype of Lenine, will the parallel continue, and at an accelerated pace? The French could not stand Robespierre for long, and they beheaded him July 27, 1794. Then ensued the reaction. There were anti-Jacobin outbreaks and massacres. The property of persons previously executed was restored to their families. Exiles returned to the country. Meanwhile France achieved great military successes without having any stable government. In order to provide the latter it was voted in 1795 that the Jacobin constitution of 1793 was impracticable, and on Sept. 23, 1795, a new constitution, providing for government by a Directory, was adopted by popular vote, the revolution was closed and the nation desired only rest and the healing of its wounds. However, the Directory did not work well, and it was but a short time until Napoleon came.

BY THE WAY

A Cornish miner was spending his "'oliday 'avin a look about." It was his first visit to an openpit, and not knowing instructions in regard to passengers riding on locomotives, "figgered as 'ow" a ride through the pit on an engine would be a pleasant way of seeing these operations. Before he reached the approach and could board the locomotive, it started off. "'old fast," yelled Jack, "'old fast." But the engineer paid no attention and opened the throttle wider. Jack, with disgust, delivered himself of the following: "Oh dam-me, go's along you great puffin' devil. I walked afor I ever saw thee."

When Wall Street read that Ambrose H. Monell had resigned as president of the International Nickel Co. to enter the national service in France it was immediately recognized the contribution one individual was making, says the *Boston News Bureau*, but few realized at what great personal sacrifice. For Monell in severing his connection with the only great nickel company in the world gave up not only the respectable salary attached to the position he occupied as president, but also the bonus he received for his services in creating new uses and demands for the metal. As Colonel Monell on the staff of General Foulis, who is in charge of American aviation, he will devote to the aviation department his exceptional abilities as an organizer. Probably few in this country are better qualified to attempt such a problem than the restless, energetic, forceful and keen Monell. The International Nickel Co. is fortunate in having in its personnel so excellent a successor to its former president. W. A. Bostwick, who now heads the company, performed countless difficult tasks as assistant to the president. Especially, in the last two years, he has had to handle many delicate matters, not the least of which were the negotiations with the Canadian government by which the nickel company gave itself over completely to the supervision of the Dominion authorities. The matter was exceedingly delicate, for complaint was repeatedly made in Canada that the company was under German domination. Mr. Bostwick's handling of the situation was so skilful that the administration in Canada came to the defence of the company to the fullest degree. The new president is young, dynamic and aggressive.

Mining engineers who are still looking for "that farm" should peruse a little notice that for many months has hung almost forgotten in the lobby of a hotel in Cuba. The tale runs as follows: "For Sale—6500 acres of the very best land in Vuelta Abajo, with about 1500 of forest of cedar and many others different rich woods, a large cattle farm with nice natural pasture, first class also to grow tobacco, sugar cane, oranges, coconuts, etc., and a valuable field of Gold Sands. Settled on the river and borough of Mantua, Pinar del Rio, 12 miles from Puerto Dimas, North coast. For information write to Marcos Garcia, 39 Escobar (altos) Habana."

A great service flag, 34 x 54 ft. in dimension, bearing the figures 11,490, has been hung across Broadway, New York, from No. 71, the building occupied by the United States Steel Corporation. This flag is to honor the 11,490 employees of the Corporation, including 305 officers, now in the Army and Navy, though there is nothing on the flag to indicate that it is connected in any way with the Steel Corporation. It being impossible to place 11,490 stars on the flag, the figures 11,490—six ft. high and made of stars—were substituted. Among the Steel Corporation's subsidiaries, the Carnegie Steel Co. leads with 1984 men and other companies contributing in an important way to the total are the American Steel and Wire Co., 1737; American Sheet and Tin Plate Co., 1417; National Tube Co., 1078; Illinois Steel Co., 1003; Tennessee Coal, Iron and Railroad Co., 911, and 577 for the American Bridge Company.

The Mine Chemist

You can tell the noble story
  Of the workers underground;
    You can laud the open-pit boys to the skies;
You can sing of deeds of glory
  That were never, never found
    'Midst the fumes of acids and of alkalies.

But I've got a kind of notion
  That the folks don't always know
    The important things in mining every day
That are done without commotion
  And without a bit of show
    In a quiet, scientific sort of way.

Just within the legal bound'ry
  Of the company's domain
    Is a dingy house that's standing all alone
But from mine clear down to foundry,
  Skip and ore dock, boat and train,
    It persists in making its importance known.

No, the lab. ain't built for beauty,
  And the boys that work inside
    Aren't loaded with collegiate degrees,
But they're burdened with a duty
  And they're trusty, true, and tried
    Just as much as if they toted Ph. D's.

LIEUT. CHARLES NICHOLLS WEBB.

December Mining Dividends

December dividends by 43 United States mining and metallurgical companies totalled $29,004,548, as compared with disbursements of $45,114,391 by 59 companies in December, 1916. In view of reductions by some of the large companies, and discontinuance of payments by others, both large and small, on account of war taxes, labor troubles, etc., the decrease is not remarkable. Holding companies paid $323,433, as compared with $1,730,163 in 1916. Canadian and Mexican companies paid $1,001,987 in 1917 and $840,824 in December, 1916.

United States Mining and Metallurgical Companies	Situation	Per Share	Total
Am. Sm. and Ref., com.	U. S.-Mex.	$1.50	$914,970
Am. Sm. and Ref., pfd.	U. S.-Mex.	1.75	875,000
Argonaut Cons., g.	Calif.	.05	10,000
Fig Creek Leasing	Ida.	.50	2,500
Boss, p.	Nev.	.02	8,170
Caledonia, l. s.	Ida.	.03	78,150
Calumet & Arizona, c.	Ariz.	2 00	1,284,924
Calumet & Hecla, c.	Mich.	10 00	1,000,000
Chino, c.	N. M.	2.00	1,739,900
Copper Range, c.	Mich.	2.50	985,997
Cresson, g. s.	Colo.	.10	122,000
Douglas	Ida.	.00½	6,394
East Butte, c.	Mont.	1.00	420,700
Eastern Talc	Vt.	.15	10,433
Federal Min. & Sm., pfd.	U. S.	1.75	203,757
Golden Cycle, g.	Colo.	.03	45,000
Grand Central	Utah	.04	20,000
Hecla, l. s.	Ida.	.05	50,000
Homestake, g.	S. D.	1 65	414,414
Internat. Nickel	U. S.-Can.	1.00	1,673,384
Iron Cap, c.	Ariz.	.50	72,095
Judge Min. & Smelt., z.	Utah	.25	120,000
Kennecott, c.	.....	1.00	2,786,679
Magma, c.	Ariz.	.50	120,000
Nevada Con., c.	Nev.	1.00	1,999,457
New Idria, q.	Calif.	.50	50,000
North Star, g.	Calif.	.60	150,000
Old Dominion, c.	Ariz.	1.00	297,071
Oroville Dredg., g.	Calif.	.12	82,385
Phelps, Dodge Corpn.	U. S.-Mex.	10 00	4,500,000
Quincy, c.	Mich.	3 00	330,000
Ray Con., c.	Ariz.	1.00	1,577,179
St. Joseph Lead	Mo.	.75	1,057,093
Silver King Con., l. s.	Utah	.10	68,859
Tintic Standard, l. s.	Utah	.03	35,241
Tomboy, g.	Colo.	.24	75,330
United Eastern, g.	Ariz.	.05	68,150
United Verde, c.	Ariz.	1.50	450,000
Utah Con., c.	Utah	.50	150 000
Utah Metal and Tunnel, c.	Utah	.30	207,476
Yellow Pine, s. l.	Nev.	.01	40,000
Yukon Gold, g.	Alas.	.07½	262,500
Utah Copper	Utah	3.50	5,685,715
Warrior Copper, pfd.	Ariz.	.70	47,600

Canadian, Mexican and So. American Companies	Situation	Per Share	Total
Cerro de Pasco, c.	So. Am.	1.25	1,009,474
Hedley, g.	B. C.	.50	60,000
Kerr Lake, s.	Ont.	.25	150,000
Lucky Tiger-Combination, g.	Mex.	.05	35,767
Mexico Mines of El Oro, g. s.	Mex.	.96	174,960
Min. Corpn. of Canada, s.	Ont.	.18¾	311,260
Santa Gertrudis, g.	Mex.	.18	270,000

Holding Companies	Situation	Per Share	Total
General Dev.	U. S.	1 00	120,000
Yukon Alaska Trust	.....	1.00	203,433

The total paid by United States mining and metallurgical companies in 1917 was $317,903,408; by Canadian, Mexican, Central and South American mines, $18,893,070; and by holding companies, $5,302,794.

A full review of the year's dividends will appear in the annual statistical number to be issued on Jan. 12. As this will be made up from revised returns, there may be some changes in the totals as here given.

Investigation of Smelters Completed in Colorado

The committee named by the Colorado Legislature last winter to make a complete and exhaustive survey of the smelting industry of the state has finished its work. It was appointed to furnish ore producers with data and information upon which they could figure with accuracy, and which would enable them to act intelligently in making contracts with smelters. The committee is headed by Senator Siewers Fincher of Breckenridge, Colorado.

The investigation, the first of the kind to be undertaken in the country, has been complete and thorough. O. R. Whitaker, a well-known mining engineer, a trustee of the Colorado School of Mines, was secured to handle the technical work. Armed with the full authority of the state, he spent months at the smelteries investigating methods and delving into the books showing metal losses, actual cost of handling the various ores, etc. The law establishing the committee did not, unfortunately, provide sufficient funds for printing enough copies of the reports to meet the demand. That the information may be given general circulation, the Colorado Metal Mining Association will print the Whitaker report and the conclusions of the committee in its annual report to the January convention of that body.

Fund Grows for 27th Engineers

If you feel like kicking the cat and are out of sorts in general, try a subscription to the Comfort Fund for the 27th Engineers and see how it will improve things. You will feel better—so will we; the list below will be longer, and happiest of all will be the man of the Twenty-Seventh when he has "one on you" that your gift will make possible. The list of those who have thus conferred happiness on themselves and their brothers in the mining regiment is as follows:

Engineering and Mining Journal	$1000.00
New York Engineering Co.	1000.00
A Friend, Nov. 23	5.00
H. H.	5.00
D. E. Charlton	5 00
H. W. Hardinge	1000.00
Frank N. Spencer	5.00
W. L. Coursen	5.00
J. H. Polhemus	5.00
J. H. Janeway	10.00
Albert D. Beers	10.00
J. E. Hayes	10.00
J. A. Van Mater	25.00
L. Vogelstein & Co.	100 00
"Cuprite"	10.00
R. H. Bassett (Hanna Ore Mining Co.)	10.00
A Friend, Dec. 10	10.00
P. A. Mosman	10.00
American Zinc, Lead and Smelting Co.	100.00
J. G. H.	5.00
Daniel Guggenheim	100.00
A. H. H.	5.00
Willard S. Morse	25.00
August Heckscher	100.00
Anaconda Copper Mining Co	1000.00
F. W. Bradley	100.00
Charles Le Vasseur	5.00
A Friend, Dec 13	50.00
Freeland Jewett	10.00
Herman A. Wagner	5.00
Francis P. Sinn	10.00
Total	$4740.00

There have been many calls for money and some perhaps feel that they have already given too much. As to this, "A Friend" expressed himself thus in sending in his contribution:

None of us who stay at home should flatter ourselves that we have given too much and that it is time for the other fellow to do his share. If we gave every red cent that we possess, it would not be too much, even if it left us strapped. It would still be less than the hundreds of thousands have given who have laid down their lives for the cause of the civilization, the benefits of which we continue to enjoy.

The men of the mining regiment deserve all the attentions we can show them. At best, mining work at home is hazardous. There is always present the danger of falling ground, a broken rope or a false step in the dark, to say nothing of missed shots and other risks that are part of the underground routine. But in the

service the Twenty-Seventh will see, these risks will be heightened by the presence of the enemy. The hanging will always be treacherous with the Boches above it. The tunnel will always be ready to change magically into an opencut through the agency of a well-placed shell, and even when the job is done and the charges are placed, the other fellow may beat them to it by shooting a countermine first.

We cannot do too much for these men. But we cannot do a thing without the money to do it. So join us in our efforts to look out for the mining industry's regiment. Send in your check payable to the *Engineering and Mining Journal*. Hold up your end of the game.

Industrial Co-operation After the War

Coöperation by the people of the United States in industrial lines after the war is urged by Roger W. Babson, of the Cambridge Board of Trade. At a recent meeting of the board Mr. Babson made suggestions and a prophecy, according to the Boston *Transcript*. He sketched certain lines along which capital and labor might work harmoniously, but he was not sure these plans would be followed, for, said he, "we hate to give the other fellow an equal opportunity with ourselves." Both capital and labor must yield something before the high cost of living will be reduced, declared the speaker.

"There are two wars in progress today," said Mr. Babson. "One war is between nations and the other war is between classes. The longer the first war lasts the more terrible the industrial conflict at its close.

"Considering the fact that only 3% of the 100,000,000 people of the United States had income enough last year to pay an income tax and that only 51% of the people are necessary in order to change laws, confiscate property and put labor in supreme command, some ask why an industrial revolution has not already taken place. There are three reasons for this: (1) Labor and the radical element is divided among itself and cannot agree on any one platform; (2) both labor and capital have failed to recognize the importance of brains and management in industry; (3) all parties lack the courage to tackle the real cause of the difficulty—namely, the descent of industrial control through inheritance and the abuse of the proxies system.

"When, however, these three obstacles are removed, I feel very dubious as to the outlook of the average investor unless the business men now get together along some really constructive program. The present method of each side staring at the other, unwilling even to talk things over together, cannot long continue. If I can do so without being considered a propagandist, I will give a guess as to the make-up of the future corporation.

"The future corporation will have only three directors. One of these will be elected by the investors in the corporation, who could be compared to the present stockholders. This means that instead of the present stockholders electing all the directors they will elect only one. This one, however, will really represent them, give all his time to the work and be adequately paid by them for his services. Another director will be elected by the manual workers. This man will be responsible for the labor problems of the plant, but he will be responsible to and paid by organized labor. The third will be elected by the management of the plant, representing the executive end, the selling end and the other managerial departments. This man will likewise be paid by the management end.

"These three men will elect the president, who shall be elected strictly on his merits. He will hold the position as an executive or judge. His job will be to get results irrespective of the individual interests of any one of the three directors. Although there will be only three members on this board of directors, yet all actions must be unanimous. Coöperation can never be brought about through the use of merely a majority vote. Each interest must be satisfied, and when each interest knows all the facts each interest can easily be satisfied. 'But what if a unanimous vote on some project cannot be obtained?' some one may ask. In the future corporation this will be provided against by a court of appeal for each industry in every state. These courts of appeal will consist of three commissioners who will be absolutely posted on their own industry. They will know what all concerns in this industry are paying, are earning, and what troubles they are up against. Any one of the three members of the board of directors of any corporation can, at any time, appeal for a decision to the court of appeal for their industry and the decision of this court shall be final.

"I am not urging either labor or capital to adopt any such plan. History has shown that we progress only under economic pressure and adopt new methods only when compelled to. Therefore neither side may have sense enough voluntarily to give up anything and so avoid a revolution. I am, however, willing to prophesy that after the industrial conflict is over the final state will not be capitalism, socialism, I. W. W.'ism or any other kind of ism. The corporation has come to stay in some form. . . .

"The only radical thing about the future corporation as I have outlined it is that it gives all three interests an equal opportunity. Strange to say, it takes more courage for any one to give the other fellow an equal chance with ourselves than to do any other one thing.

"If I represent any class it is the consumers. There are over 100,000,000 of us in this country, and we all are trying to pull ourselves up by our boot-straps.

"Statistics show that the dollar today is worth only two-thirds of what it was a few years ago and is becoming worth less and less every minute. The retailers lay it to the manufacturers and the manufacturers lay it to the retailers; the capitalists blame it to labor and the labor interests blame it to the capitalists. For if wages go up, prices must go up; and if prices go up, then wages must go up.

"The way to lower the cost of living and make life worth living for all people is to bring about real cooperation among these different interests in order that all may pull together to increase production and eliminate waste. Capital is wrong in its unwillingness to give labor a real interest in the business; but labor also is absolutely wrong in its basic theory that it can get richer by producing less. Capital must learn to give up and labor must learn to wake up.

"The nation which profits most from this great European war will be the nation first to bring about this spirit of coöperation among the different interests involved in production and distribution."

Personals

Have you joined the Comfort Club for the 27th Engineers?

J. P. Hutchins is here from Petrograd.

Victor Rakowsky, of Joplin, Mo., was in Washington last week on a business trip.

Rush M. Hess recently passed through St. Louis on his way to Birmingham, Alabama.

O. F. Wenz has severed his connections with the Moctezuma Copper Co. at Nacozari, Sonora, Mex.

George Otis Smith, director of the U. S. Geological Survey, is recovering from an attack of typhoid fever.

Howland Bancroft expects to be at the Engineers' Club, New York, during the month of January.

O. H. Griggs, mine operator of Virginia, Minn., left for France to enter service with the American Red Cross.

R. D. George, state geologist of Colorado, was in Washington last week collecting data on the occurrence of oil and gas.

E. F. Lake, metallurgical engineer of Detroit, Mich., has been made a sistant superintendent of the Rich Tool Co., Chicago.

Dr. Joseph Hyde Pratt is lieutenant-colonel of the 105th Regiment of Engineers stationed at Camp Sevier, Greenville, South Carolina.

Capt. John L. Church, Engineer Officers Reserve Corps, has been assigned to the 308th Engineers, Camp Sherman, Chillicothe, Ohio.

Col. William B. Thompson, head of the Red Cross Mission in Petrograd for the last six months, arrived in New York on Dec. 25 with his staff.

A. W. Newberry and **E. G. Snedaker,** both first lieutenants, have been assigned to the Fourth Engineers, now stationed at Vancouver Barracks, Washington.

W. P. Allen, chief engineer of the Anniston Steel Co., has resigned to accept a position on the engineering staff of the Tennessee Coal, Iron and Railroad Co.

Hugh F. Marriott, consulting engineer for the Central Mining and Investment Corporation, will succeed Edgar Taylor as president of the Institution of Mining and Metallurgy.

Col. Joseph W. Boyle, of Dawson, Yukon, who has been in Russia for some months representing the British American Commission has been decorated by Gen. Korniloff with the Order of St. Stanislaus.

E. P. Scallon, superintendent of the Lincoln mine at Virginia, Minn., will take charge of the Hill-Annex mine at Calumet, Minn., which is also operated by the Interstate Iron Co., the Mesabi operating subsidiary of Jones & Laughlin Company.

Major George S. Weinberg, Russian representative of the National Lead Co., the Worthington Pump and Machinery Co. and other interests, has been ordered to active duty with the 30th Engineers at the American University camp, District of Columbia.

A. L. Field, assistant metallurgist at the Lake Superior station of the U. S. Bureau of Mines, has resigned to enter private employment and is succeeded by **P. H. Royster,** who has been connected with the iron and steel investigation of the Bureau for several years.

C. T. Watson and **C. H. Scheuer** have been commissioned captains in the Engineer Officers Reserve Corps; **A. R. McGuire, C. T. Pearce** and **M. W. Ford,** first lieutenants, and have received orders to report for duty on Jan. 5 at Camp Lee, Petersburg, Virginia.

Bruce C. Yates, assistant superintendent and chief engineer of the Homestake Mining Co., Lead, S. D., has been appointed superintendent to succeed **Richard Blackstone** who retired on Jan. 1, 1918. Mr. Yates is a graduate of the University of Nebraska and has been with the Homestake company for the last 20 years.

L. R. Wallace is general manager of the Andes Copper Mining Co., Potrerillos, Chile. Other members of the staff are: **George Montandon,** chief engineer, in charge of all railroad construction work; **A. M. Hoffman,** engineer in charge of mill and other construction work; **W. L. Du Moulin,** hydraulic engineer, in charge of pipe line construction; **M. Fernandez,** mine superintendent; **R. Müller,** business manager; and **C. Morrel,** railway superintendent.

Obituary

A. A. Blow, a distinguished mining engineer, died in Knoxville, Tenn., Jan. 2.

Fred T. Greene, consulting engineer of the Elm Orlu Mining Co., Butte, Mont., was killed at Butte on Dec. 25 when the automobile in which he was riding was run down by a Northern Pacific train.

James W. Malcolmson, consulting engineer of Kansas City, died suddenly on Dec. 26. He was consulting engineer for the Lucky Tiger Combination Gold Mining Co., operating at El Tigre, Sonora, Mexico.

Joseph H. Woodward, president of the Woodward Iron Co., Alabama, died on Dec. 15, aged 60 years. He was one of the pioneers in the iron industry in the Birmingham district in which he resided for the last 36 years.

Benjamin Franklin Taylor, former superintendent of the Zeila mine at Jackson, Calif., died at Jackson on Dec. 26, aged 75 years. He was born at Coshocton, Ohio, and went to California in 1859 where be became identified with various mining enterprises on the Mother Lode.

Timothy W. Sprague, consulting engineer of Boston, died on Dec. 7, after an operation for appendicitis. He was born in 1866 and was graduated from the Massachusetts Institute of Technology. He was engaged as an electrical engineer since 1887 and was formerly identified with the General Electric Co. and the Westinghouse-Church-Kerr Company.

Edward Stillman, a pioneer of the Yukon died at Dawson on Nov. 23, aged 46 years. He was an Englishman and joined the Northwest Mounted Police when a young man, going to the Yukon in 1897 with a detachment of the force. He afterwards engaged in mining and some years since joined the staff of the Canadian Klondike Mining Co. with which he was connected until his death.

Silas Wright Eccles, vice president of the American Smelting and Refining Co., died on Dec. 31 at St. Augustine, Fla., where he had gone for his health. He was born at Washington, Ill., in 1852. He commenced his career in business as a station agent and telegraph operator for the Chicago & Alton R.R. In 1876 he went to the Denver & Rio Grande R.R. and a year later was appointed general passenger agent of the system. Prior to becoming connected with the American Smelting and Refining Co., Mr. Eccles was traffic manager of the Oregon Short Line R.R. In 1900 he became identified with the smelting and refining business, and became a director of the American Smelting and Refining Co. At the time of his death he was also president of the Nevada Northern R.R., president of the Alaska Steamship Co., president of the Copper River and Northwestern R.R. and an officer and director of various other corporations.

Societies

Coming Meetings

Mining and Metallurgical Society of America	New York	Jan.	8
American Institute of Consulting Engineers	New York	Jan.	14
American Society of Civil Engineers	New York	Jan.	22-25
American Concrete Institute	Boston	Feb.	7- 9
American Institute of Mining Engineers	New York	Feb.	18-21

State College of Washington—The School of Mines announces that beginning Jan. 7, 1918, a 12 weeks' course in mining will be offered to the prospectors and mining operators of the Northwest. Instruction will be given in mining, metallurgy, geology and ore deposits, assaying, chemistry, surveying and ore testing. These courses will be given in the winter School of Mines under a faculty of seven professors from the School of Mines, and the departments of geology and chemistry.

Colorado Scientific Society at its thirty-fifth annual meeting elected the following officers to serve during 1918: President, Dr. Richard B. Moore; first vice president, Lewis B. Skinner; second vice president, M. B. Holt; treasurer, John W. Richards; secretary, Harry J. Wolf; executive committee, term expiring Jan. 1, 1921: J.gium. Clare Evans and M. S. MacCarthy. The annual dinner of the Society was held on Dec. 29 at the University Club, Denver.

American Association of Engineers, Washington Chapter, held a meeting in Washington, D. C., on Dec. 14. The following were elected officers of the chapter: F. R. Weller, consulting engineer, president; A. S. Grossberg, chief designer, bureau yards and docks, first vice president; Harry Stevens, consulting engineer, second vice president; Capt. D. S. Hays, engineer corps, U. S. A., secretary; O. M. Sutherland, mechanical engineer, bureau yards and docks, treasurer. There are 100 members in Washington to date.

American Institute of Mining Engineers will hold its 116th meeting in New York on Feb. 18-21. Over 50 technical papers to be presented have been received by the committee on publications. The program as announced to date includes a "War Smoker" to be held on the evening of Feb. 18 and a "Hoover" dinner at the Hotel Biltmore on the evening of Feb. 20. On the following day, an excursion will be made to Princeton University. The committee on membership has drawn up a petition for amendment of the constitutional requirements for membership to be acted on at the meeting. The amendment provides that "a person to be eligible for election or transfer into the class of members must be at least 27 years of age and must have had at least six years' employment in the practice of engineering, mining, geology, metallurgy or chemistry, during at least three years of which he must have held positions of responsibility in one or more of these fields."

Industrial News

Jerome-Del Monte Copper Co., Jerome, Ariz., has ordered a Layne & Bowler sinking pump of a new type which will be used in connection with the deepening of one of its shafts.

Worthington Pump and Machinery Corporation, New York, announces that C. P. Coleman was elected president of the Corporation on Dec. 31, 1917, at a meeting of the board of directors.

Algoma Steel Corporation of Sault Ste. Marie, Ont., has awarded a contract to the Willputte Coke Oven Corporation of New York for the construction of 30 byproduct coke ovens. The work is to be completed by the middle of the year.

American Association for the Advancement of Science opened its seventieth annual convention at Pittsburgh on Dec. 29. Discussion of scientific subjects and appliances having direct relation to the war were a feature of the convention. Dr. Charles R. Van Hise, president of the University of Wisconsin, was among those scheduled to speak.

Trade Catalogs

Smooth-On Instruction Book, No. 16. Smooth-On Manufacturing Co., Jersey City, N. J., 3½ x 6¼ in.; pp. 16. The booklet describes various cements for repairing breaks or leaks in iron piping, castings, etc. It also contains the standard sizes of "Smooth-On" coated corrugated gaskets for flanged pipes from two to 26 inches.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British putents are supplied at 40c. each.

Crucibles for Fused Quartz—Method of Preparing Crucibles for Preparing Fused Quartz. Frederick G. Keyes, Hoboken, N. J., assignor to Cooper Hewitt Manufacturing Company, Hoboken, N. J. (U. S. No. 1,249,766; Dec. 11, 1917.)

Sampler Mechanism. Erskine Ramsay, Birmingham, Ala. (U. S. No. 1,249,491; Dec. 11, 1917.)

Separator. George E. Keller and Jesse F. Pender, Vancouver, Wash. (U. S. No. 1,249,635; Dec. 11, 1917.)

Tube Mill. Alexander M. Read, Columbus, Ohio, assignor to the Jeffrey Manufacturing Co., Columbus, Ohio. (U. S. No. 1,249,494; Dec. 11, 1917.)

Zinc-Extracting Furnace with Vertical Retorts. Roman v. Zelewski, Engis, Belgium. (U. S. No. 1,250,071; Dec. 11, 1917.)

Editorial Correspondence

SAN FRANCISCO—Dec. 29

Annual Assessment Work Exemption has been discussed in a circular issued by Commissioner of Corporations, H. L. Carnahan, who also provided necessary blanks for use in carrying out the provisions of the resolution adopted by Congress, to assist the several hundred mining claimholders of California to take advantage of this action of Congress. The State Corporation Department especially called to the attention of the mine claimholders the important fact that even though assessment work had been done on their claims, it is advisable to fill out and file the required notice. If the assessment work has been done, proof of labor also should be made and filed, so that the owners may secure the benefit of this work upon proceedings to obtain a patent. In the case of proofs of assessment work there is a provision made for a 30-day period after Jan. 1, during which time the recording of the labor claim may be completed. But to take advantage of the suspension of the labor requirement, notice must have been filed "in the office where the location notice or certificate is recorded on or before Dec. 31." The notice is to the effect that the owner desires to hold his mining claim under the resolution adopted by Congress. In California alone, corporations listed with the Department, the saving in labor amounts to several hundred thousand dollars annually by reason of the release from assessment work.

Naval Oil Reserve Lands, which have been the subject of much interest in the latest bill as proposed in Congress in the fight against California operators, provides for commandeering in a wholesale manner all oil properties within the reserves, together with all wells and equipments thereon. The effect of this proposal caused the stimulation of development work in districts outside of the reserve, notably in the McKittrick and Lost Hills-Belridge regions. It is even intimated in reports from the fields that advance information of the Navy Department's intention of urging such legislation may possibly have had something to do with the recent launching of an extensive drilling campaign in and around McKittrick by the Standard Oil Co. The McKittrick and Lost Hills-Belridge districts are not within the naval reserve, which may explain the greatly increased activity in these fields within the last few weeks. The Standard has been leading in this activity, while the company's operations on lands owned or leased within the limits of the reserve have been slowing down somewhat. Another factor in this increase of development work is that one of the bills now pending in Congress provides for the opening under a leasing plan of land outside of the naval reserve and the abandonment of the Government's policy of litigation under the withdrawal orders. This is expected to encourage the development of the districts of northern Kern County, Maricopa and that part of the Midway field outside of the reserve.

Agitation against Mother Lode Mines in Amador County again begun by the farmers on Dry Creek. Suits have been brought by the Sacramento Farmers Association against all the large properties except the Old Eureka, South Keystone and Plymouth. Two of these mines are not producing to an extent to make them liable to the demands of the farmers and the Plymouth is so situated geographically as to avoid the squabble. There is an agreement of many years' standing between the farmers and the miners that no further suits would be brought and that all claims would be arbitrated either on sufficiency of dams or for damages. There has been no well-founded claim of insufficiency of dams, which have been approved by the California Debris Commission, and the water passing over these dams is clear and an actual asset to the farmers. But the farmers, with their usual negligence, have allowed the stream to become choked with vegetation which no doubt causes overflows. About the only way to satisfy the farmers on Dry Creek is for the mine owners to furnish the water, keep the stream clear of growth and rubbish and furnish the money to operate the farms and make them a sizable Christmas present every year. It would not be at all surprising, if these suits are pressed, to see a number of the mines closed down until the farmers come to their senses. The cost of gold mining at present is discouraging enough and the addition of further costs in the way of legal expenses and the payment of damages, if the suits should be successful, would make gold mining on the Mother Lode a losing business. The farmers engaged in the suits are aware that without the operation of the mines there would be insufficient water for irrigation. However, the farmers might sue out an injunction to restrain the mines from closing down and possibly persuade the courts to require the mines to be kept in operation for the benefit of the farmers, even if they produced enough gold only to meet the cost of keeping the properties alive. If there is anything the California farmers in mining districts have not demanded or would not demand it is evidently something they have not seen or thought of.

BUTTE—Dec. 29

Compensation Law provides that a working surplus in the industrial accident fund shall be created by the board. So far it was not found necessary to resort to this action but steps are now being taken to put the provision into effect. According to an opinion recently prepared by Assistant Attorney General R. L. Mitchell of Montana, the act authorizes the board to collect assessments or premiums from the employers of each class until there shall be accumulated in the industrial accident fund a sufficient balance to meet the requirements of such fund. No announcement has as yet been made regarding the methods adopted by the board for collecting the assessments and premiums.

DENVER—Dec. 28

Ore Shipments from Silverton declined during November as a result of the usual winter conditions and were as follows: From Silver Lake Custom mill, 23 cars: Iowa-Tiger, 21; Sunnyside, 13; Pride of the West, 11; Highland Mary and Koehler Tunnel, eight each; Mayflower Leasing Co., six; S. D. & G. Leasing Co., five; Celeste Fattor and Red Mt. Mines, four each; Mears-Wilfley mill, Colorado Metals Co., and Gold King, three each; Dives, Hero, K. P. & G., and Fattor & Satore, two each; Guston Leasing Co., Honey Comb Lease, Lackawanna, and Ohio & Oklahoma Leasing Co., one car each; total, 124 cars. The following shipments were made to the North Star Custom mill: S. D. & G. Leasing Co., 48 cars; Ross Mining Co., one; Guston, four: total, 53. The following shipments were made to the Contention mill: From Guston Leasing Co., 15 cars. The following shipments were made to the Silver Lake mill: Guston, four cars; Kansas City, one; total, 5 cars. Grand total of all shipments, including miscellaneous small shipments not enumerated above, 209 cars.

SALT LAKE CITY—Dec. 29

Amendment To Excess-Profits Tax Law was discussed at the meeting of the Utah chapter of the American Mining Congress held on Dec. 18, providing that capital invested should be based on physical condition of properties Jan. 1. The meeting was called to act on information received from Utah mining delegates at Washington, that the excess-profits tax law was likely to be amended, and that an expression from metal interests on the invested-capital phase was desired. It was the sense of the members that such a readjustment would work a hardship on the mining interests inasmuch as the amount of ore in the properties was problematical.

WALLACE, IDAHO—Dec. 29

Control of Success Mining Co. was decided and the long fight came to an end on the evening of Dec. 18, when, at the annual meeting of stockholders, Franklin Pfirman was elected president of the company and a board of directors of his selection. The fight was precipitated over a year and a half ago, when Pfirman, as a stockholder, made a demand to inspect the books, ore contracts, maps, etc., which was refused by P. J. Gearon, president and manager of the company. Pfirman applied to the District Court for an order directing the management to grant his request, which was issued. Gearon appealed to the Supreme Court, and while this was pending, the time arrived for the annual meeting of stockholders in April last. Pfirman applied to the court for an injunction against holding the meeting on the ground, that, if held, the present officers would be elected for another year and that if the Supreme Court affirmed the order of the District Court for an inspection of the books, it would be shown that the interest of the stockholders required a change in management. The restraining order was issued and the meeting of the stockholders was postponed until Dec. 17. The Supreme Court a little later ordered the inspection, the results of which were embodied in a detailed report prepared by Pfirman and mailed to all stockholders with a request to send him their proxies. With this request, a majority of the stockholders, who are scattered all over the United States, and number about 3000, complied. Thereupon Pfirman applied to the court to dismiss the injunction against holding the annual meeting, for the reason that the cause which made it necessary no longer existed. Upon this showing, the court dissolved the injunction and the meeting was held with the result stated above. The new officers have made sweeping reductions in salaries, installed a new superintendent and promise to make further reductions in operating expenses.

CALUMET, MICH.—Dec. 27

Bonuses at Calumet & Hecla, together with premium payments to the 14,000 employees of the company, including the 10 subsidiary mining, milling and smelting companies, will continue in force until July, 1918, according to a notice posted at the various properties. The men had been uncertain as to whether or not the bonus and premium payments would be continued. They felt that the companies would make no reduction in wages at this time, but, because of the uncertainty as to the Government's attitude on the price of copper after the first of the year, there was some question. Now that the announcement has been made, however, the labor situation as far as these companies are concerned is favorable. All of the old men are staying and few of the men imported from other districts are showing any inclination to leave. The Calumet & Hecla and its subsidiaries have been paying the highest wages offered mine and mill workers in the district during the last half dozen years and were the first companies to increase wages at the beginning of the war, although labor was more than plentiful at that time. For the last year and a half, a 10% premium over the regular wages has been paid and for the last six months, a bonus of 50c. per day for every day worked has been given in addition. The Copper Range, Quincy, Mohawk and Wolverine have followed the Calumet & Hecla in offering special premiums to employees and it is anticipated that these companies too, will continue such payments into the coming year. The labor situation right now is much easier that it has been. There has been a slacking up in the industries in many parts of the country during the last month or six weeks and it has not been difficult to get men to come to the copper-mining regions for work, particularly with the wages being offered. Many men are coming in now and more are expected. There has been a request, sent out by the state fuel administrator, that all of the industries in Michigan not connected with the making of munitions of war, close their factories for the week, Dec. 22 to Dec. 29, to help save coal, but this does not affect the copper-mining industry and there has been no suspension whatever here or in the iron-mining districts of the peninsular.

JOPLIN, MO.—Dec. 29

Wages in Sheet-Ground District were cut 25c. per day per man, according to a decision reached at a meeting of operators of Webb City-Carterville camp held Dec. 28. It was, however, stipulated that no wage should be below $2.50 per day. The operators were compelled to take this action since they were unwilling to operate longer

at a loss, and the average basis price of zinc blende last month indicated a cut in wages but as a boost in the prices was hoped for, this action was deferred until now. The operators in the past have preferred maintaining the wage scale and on several previous occasions have decided in favor of the men.

Fire Destroyed the New Plant of the Butte-Kansas Mining Co., at Waco, Mo., on Christmas morning. The plant, which was of 400-ton capacity, had only been completed and placed in operation a few days previously. The origin of the fire is a mystery, and there is suspicion that it was caused by pro-German influences. At the burning of the Scott mill at Duenweg, a few weeks ago, this charge was freely made by Haywood Scott, principal owner, who is at the head of the Minute men in this district. The Butte-Kansas mill was insured for $50,000 and it is estimated the loss was $75,000. It is likely that it will be rebuilt. Owners are eastern men, E. A. Wiltsee, of Joplin, local manager.

BONNE TERRE, MO.—Dec. 26

The Fredericktown District in the southeastern part of the state has several important producing properties which are developing and are expected to increase their output. The Missouri Metals Corporation, operating the classic mine La Motte, is doing a great deal of work and the tonnage ultimately treated will be about 8000 tons a day. This property produces lead, copper, nickel and cobalt ores, and there are considerable ore reserves containing the above metals. At present only lead and copper are being produced, but in the near future, production should be made from Mine La Motte of cobalt and nickel. Considerable experimental work is being done in reference to the complex copper-cobalt-nickel ores. This property will be the only one in southeast Missouri that will do all its mining by steam shovels. The ore comes to the surface and has a thickness of approximately 75 ft. The present plans contemplate mining the entire orebody by steam shovels and giving it a preliminary crushing in a 60 by 84-in. Traylor jaw crusher. The product from the crusher, after suitable sizing, will be sent to a hand-picking plant, where the ore will be separated from the barren waste. The usual milling practice will then doubtlessly be used in treating the ore from the picking plant. It is interesting to note that this property is the first one in southeast Missouri to install the Diesel engine for generation of power. These engines are giving great satisfaction, producing cheap power notwithstanding the high price of crude oil. The Missouri Cobalt Co., which operates the property of the old North American Lead Co. at Fredericktown, has been constructing new reduction works, comprising mill, smeltery, and refinery. The mill started in operation about Dec. 1. The ore is crushed in gyratory crushers and passed through a picking department and then sent to the mill, where it is fed directly to ball mills, which discharge to the ore classifiers. The overflow is properly prepared by further classification and treated on tables and by flotation. The table tailings from the coarse tables are further ground in tube mills and sent to the flotation tables. The mill will yield two concentrates, lead concentrates, which will offer no special difficulties in regard to smelting, and complex copper-cobalt-nickel concentrates, which present the real problem. These concentrates will be treated by a secret process and no information is available in regard to the details of it. The Catharine mine, formerly operated by the Federal Lead Co., has been closed down. This property produced only lead, the tonnage treated being about 600 tons a day. There is a small tungsten mine at Silver Mines, about 10 miles south of Fredericktown; at last reports this property was not operating, although there was some talk about beginning operations again.

TORONTO—Dec. 29

Imperial Oil, Ltd., has been incorporated under the laws of Canada with headquarters at Montreal and a capital stock of $50,000,000, to take over the business of refining and marketing petroleum now carried on by the Imperial Oil Co., Ltd., now controlled by the Standard Oil Co. of New Jersey. The provisional directors are: Walter C. Teagle, C. O. Stillman, G. W. Mayer and G. H. Smith, oil operators, and Hon. W. J. Hanna.

Industrial Prosperity to Continue is the opinion in Canadian business circles as the result of the general parliamentary election held on Dec. 17, at which the Union Government of Sir Robert Borden was sustained by the majority, which is likely to be considerably increased when the votes of the soldiers overseas are counted. It was strongly realized that an adverse vote would have been ruinous to the present industrial prosperity, as discontinuance of orders from England and the United States for war munitions and supplies would have been looked for. The general appreciation of the attitude of Canada by the Allies is regarded as an assurance that Canadian resources will continue to be heavily drawn upon for war requirements.

Squabble Over Kirkland Lake Deal between the opposing factions goes merrily on, with the result so far that the public is getting a good deal of interesting information and the only ones to suffer are the principals. The Beaver and the Temiskaming both have the same board of directors, and the Beaver has an option on a promising property in Kirkland Lake known as the Kirkland Lake Gold Mines. This property has been almost all paid for by the Beaver and has been developed to the 700-ft. level, and is stated by the Beaver company to have $1,000,000 gross ore developed. The Beaver, however, is running short of money and has offered the Temiskaming, a half interest at 40c. a share. This deal is bitterly opposed by Messrs. Wills and Morganstein who are large shareholders in the Temiskaming. The inside situation seems to be that these gentlemen want representation on the Temiskaming board, to which they appear to be entitled, but are unable to obtain it from Mr. Culver, the president and managing director. A special meeting of the Temiskaming was called to ratify the deal for the half interest in the Kirkland Lake, but proxies to oppose it were asked for by Wills. A counterstroke is delivered by Culver who issues a circular explaining the inside history of the Kirkland Porphyry flotation. Wills and Morganstein come back with a temporary injunction to restrain Culver from using any of the Temiskaming surplus to acquire interests in any properties and to prevent the payment of dividends. This is to be heard on Jan. 3. The meeting was held Dec. 28, but was adjourned to Dec. 31, during which interval the proxies will be counted. It is stated that Wills will have a majority. If the statements made regarding the value of the Kirkland Lake mine are correct, the deal would appear to be a good one for the Temiskaming. Unfortunately, however, no detailed information about the property is available and no report has been made by an independent engineer, and, as a matter of fact, there do not appear to be assay plans of any sort. The Temiskaming is asked to enter into a deal without the proper information being given, and this appears to be a mistake notwithstanding that the directors of the two companies are practically the same. Wills and Morganstein would seem, on account of their stock holding, to be entitled to representation on the board of directors, and if they were given this there would be no opposition. In the meantime it is understood that the Beaver alone is unable to finance the property and it is to be closed down, according to reports.

The Mining News

ALABAMA

BIRMINGHAM CLAY PRODUCTS CO. (Birmingham)—Has been organized with W. B. White, president; J. M. Bradley, vice president and J. D. Rucker, secretary-treasurer.

ARIZONA

Gila County

NEW DOMINION (Globe)—Payment of $50,000 recently made on property. On 800-ft. level, substantial body of 11% ore developed recently. Sinking will continue to 1200-ft. level.

Pinal County

BROKEN HILLS (Ray)—New oreshoot opened beneath outcrop uncovered in process of road building.

U. S. VANADIUM (Kelvin)—New concentrator estimated to be 50% complete. Nearly all equipment received.

GILA DEVELOPMENT (Kelvin)—New pumping equipment installed and sinking resumed. Lateral development on 200-ft. level will begin soon.

PINAL CONSOLIDATED (Price)—Hauling to railroad by pack animals. High-grade silver ore being opened in lower levels.

RAY HERCULES (Kelvin)—At central power plant first Diesel engine unit of 1000 hp. ready for trial run; structural steel work on mill and shop buildings practically completed. Developing water supply on Gila River.

SILVER DIVIDE (Ray)—New company organized to take over Bowman group of claims between Ray and Superior. Developing.

Yavapai County

MONTE DE COBRE (Mayer)—In developing Barbara mine 40 ft. of ore cut in tunnel driven to intercept old shaft.

ARIZONA-BINGHAMPTON (Stoddard)—Thirty feet of good ore reported cut on 600-ft. level; carries considerable shipping ore.

POCAHONTAS (Mayer)—In crosscut at 150-ft. level, 12 ft. of milling-grade ore opened, being chiefly silver-lead. Material has been ordered for 50-ton flotation plant.

CIRCLE PEAK (Mayer)—Circle Peak Mining Co., organized by John A. Peacock, of Fort Worth, Tex., to take over Cumberlain mine and mill and develop 10 claims near Cumberlain property.

GARFORD (Prescott)—Garford Syndicate owning Copper Hill group in Copper Basin district has taken over Robinson group and started development. Considerable tonnage of zinc, lead and copper ore developed.

ARKANSAS

Boone County

K AND M (Harrison)—Taken over by Continental Mining Co., which is also operating Bear Hill and Beulah. W. O. Krueger, president of Continental, states machinery has been ordered for another mill to be erected at once.

Marion County

MONKEY HILL (Yellville)—Leased by A. N. Stanfield, of Oklahoma City; equipped with 100-ton mill and ground opened.

CLINTON (Rush)—J. L. Lewis and associates doing development on Clinton Zinc Co.'s land, near mouth of Boat Creek. Working under lease.

BATY (Yellville)—Purchased by J. H. Griffith and associates, of Oklahoma City; equipped with small mill. Development done by shafts and drifts.

PHILLIPS (Yellville)—Miami-Ada Mining Co. lately took over Phillips zinc mine near here, completed 30-ft. shaft; drifting at this level on a run of blende. Expect to start mill within a month.

CALIFORNIA

Eldorado County

NORSE MINING CO. (San Francisco)—Permitted to sell 18,697 shares preferred stock to Fritz S. Olsen, 11,283 shares to J. S. Anany; to issue one share each to Fred Juell, F. K. Dedrick and Siguard Hansen; to issue 2500 shares each to Hansen and M. G. Axman in exchange for mining claims and purchase options; to sell 40,017 shares to above named persons. Consists of placer claims on middle fork of Cosumne River.

Glenn County

IN FLOUTS DISTRICT, John M. Connolly reported having discovered silver-bearing ground with small amount of gold.

Inyo County

GRAND VIEW BORAX (Ryan)—Mile Derio was killed, Nov. 21, by fall into shaft.

Nevada County

BEN FRANKLIN-ALASKA (Grass Valley)—Option on this group of claims sold by T. W. Bosanko to Grass Valley Deep Mines Corporation of Nevada and financed by Goldfield and Colorado capital. Claims situated about seven miles south of this city; ore has been uncovered on lowest level and property will be developed. Bosanko retained as superintendent.

Placer County

IN STEEP HOLLOW DISTRICT, the Seltzer mine reported as having struck high-grade ore. Operated by a San Jose company for some time and considerable work done.

Shasta County

DONKEY (Ingot)—This group of copper claims bonded to G. C. Taylor and associates by Chester Lowman for two years. Will be operated on 10% royalty per ton basis to owner on all ores assaying up to $35 per ton, ore above this percentage being on 15% basis. Adjoins Afterthought group and formerly worked by Mammoth Copper Co., but operations discontinued, reason being unknown. Stated considerable ore reserves exposed.

BULLY HILL MINE (Winthrop)—Developing ground near Delmar opened good ore from Rising Star shaft, in Anchor mine; high-grade ore reported in new workings from 1000-ft. level, having good copper contents with some zinc, silver and gold also showing. Shipping to Mammoth smeltery at Kennett. Operated by Arnstein interests of New York, planning to erect large flotation plant to avoid trouble with farmers over sulphur fumes.

Siskiyou County

SHASTA-BELMONT (Copper City) — copper-zinc ore opened in lower levels.

GRAY EAGLE COPPER CO. (Happy Camp)—Completing surface operations preparatory to underground development throughout winter. Unusually long, dry season favorable to extensive work. Considerable exploration being done with diamond drills resulting in extension of ore-bearing area. If results warrant, railroad will be constructed in spring to some point on Southern Pacific railroad. Owned by Mason Valley Mines Co. and because of difficulties in operating Thompson smeltery, may build flotation plant at this property; other properties in district also being worked under bonds and options.

Stanislaus County

STANISLAUS DEVELOPMENT CO. (Knights Ferry)—A. D. Hadsel, of Los Angeles, operating under name of this company, leased 800 acres in old river bed of Stanislaus River from Rodden Brothers, local bankers, intending to install dredging equipment for gold recovery. Previous operations have not showed profitable results but reported prospecting on this site proved gold in paying quantities.

Trinity County

GOLD QUARTZ DISCOVERY reported having been made on Maple Creek about four and a half miles from Junction City, by R. H. Bailey.

Tuolumne County

SPRINGFIELD TUNNEL AND DEVELOPMENT CO. (Columbia)—"Million Dollar Tunnel" for development of old workings will be commenced about Jan. 1, 1918, if method to secure necessary capital decided upon at directors' meeting, in San Francisco, proves successful. Project originated with A. L. Horner, who nearly completed work when it was discontinued because of his death. Joseph Cademartori, superintendent of mine.

COLORADO

Clear Creek County

METALS TUNNEL CO. (Idaho Springs)—Contract will be let to advance tunnel 100 ft.

KITTY OUSLEY (Silver Plume)—High-grade lead ore opened. Last shipment assays from 45 to 50% lead.

CAPITOL (Georgetown)—Lessees, Bruce & Co., mined and shipped to local sampling plant 30 tons of high-grade ore.

SCEPTER (Georgetown)—Aërial tram under construction from mine to loading station on Colorado & Southern Ry. A. R. Longeley, manager.

WASATCH-COLORADO MINING CO. (Georgetown)—Opened payable lead-zinc ore; lead ore concentrated in the mill, from which carload of concentrates shipped recently. Two cars of zinc ore shipped to local sampling plant.

BURNS-MOORE (Idaho Springs)—The 4000-ft. crosscut tunnel in Chicago Creek has been placed in operating condition. Resumed driving in breast of tunnel, to be advanced to cut Lamertine vein about 2000 ft. below surface. Frank E. Wire, manager.

Gilpin County

GOLD LODE (Central City)—Producing good-grade gold-silver ore.

RIDGE (Central City)—Operations to be resumed. Shaft will be sunk another 100 ft.

POWERS (Central City)—Lessee, Comfort & Co. and sub-lessees shipping good-grade copper-silver ore.

GILPIN-UNION (Central City)—Retimbering shaft; lateral development to be done later. Air will be purchased from Carr mine.

Ouray County

MICKY BREEN (Ouray)—Lessees shipping lead-silver ore.

VERNON (Ironton)—Work suspended for winter, except some on development. Mill may be enlarged next spring.

SILVER LINK (Ouray)—Driving drift by contract to cut vein several hundred feet above where opened in old workings; in 300 ft., 500 ft. yet to be driven.

BARSTOW (Ouray)—Five teams hauling fluorspar to Ouray, for treatment in Forrester mill before shipping. Being worked by lessees.

San Juan County

SHIPMENTS FROM SAN JUAN DISTRICT during November to outside smelting plants, 124 cars; North Star mill, 48 cars; Silver Lake mill, five; to Contention mill, 15 cars.

HIGHLAND MARY (Silverton) — Leasing company operating steadily.

TELESCOPE (Chattanooga) — Development will be continued all winter; will resume shipments next spring.

SUNNYSIDE (Eureka)—Mill building completed, with exception of lower tram terminal; work will now be inside. New aërial tram nearing completion.

HAMLET (Silverton)—Remodeling mill for immediate operation; delayed by non-arrival of machinery. Considerable development under way. Operated by Colorado Springs men.

San Miguel County

SMUGGLER-UNION (Telluride) — Ore from Smuggler, Humboldt and Black Bear being treated in Smuggler mill on custom basis. Flotation process successful. Both zinc and gold-silver-lead concentrates shipped.

Summit County

GOLDEN QUEEN (Kokomo)—Regular shipments made. Vein cut in lower tunnel recently.

JUNE BUG (Breckenridge)—Lease and option taken; work will be done this winter. Good-grade silver ore opened recently in development work. Mine in Gibson Gulch.

IRON MASK (Breckenridge)—Operation on large scale contemplated. Shipments of iron-silver-gold and lead-carbonate ores made.

AMERICAN METALS CO. (Denver)—Tramway from mill to mine at Climax station on Colorado & Southern railroad completed. Expects mill to be completed in February. Molybdenum ore will be treated; capacity of plant 250 tons daily.

Teller County

DEER HORN (Cripple Creek)—Lessees on this Stratton's Cripple Creek Mining and Development Co. property made initial shipment to Portland mill at Colorado Springs. Shoot of good-grade ore opened.

ALPHA AND OMEGA (Cripple Creek)—These Gold Hill properties being operated by the Dig Gold Mining Co.; M. B. Burke, president and general manager. Electric hoist and compressor installed.

CRESSON (Cripple Creek)—Developing on fifth level to open ground between shaft and Funeral dike, southeast of shaft. Raising between 15th and 14th levels, and between 16th and 15th, at intersection of vein and silver dike, opened good-grade ore almost all the way. Drifting on 14th level for 80 ft. has also been done in good-grade ore.

IDAHO

Shoshone County

CALEDONIA (Kellogg)—Earnings will no doubt continue to decrease unless company should be successful in locating oreshoot on Keating level, now not regarded probable. Has surplus of approximately $800,000.

DOUGLAS (Beeler)—Dividend of 3c. per share paid by company on Dec. 21, being royalty on ore shipments for three months paid by Anaconda company, which has Douglas under lease. Ore runs about 20% zinc, 12% lead and 6 oz. silver per ton. Anaconda pays flat royalty of $3 per ton on all shipments.

AJAX (Burke)—Being developed by extension of Oom Paul tunnel, which will cut vein at 1200 ft. below original workings; also developing from Moonlight tunnel, between upper workings and Oom Paul, where continuous oreshoot of fair grade proved for 400 ft. Hoist underground and sinking along vein, to be crosscut at 200 ft. Considerable ore exposed in upper tunnels. Adjoins Hercules on the east and may be on same vein. Control of company owned in Lynn, Mass.

MICHIGAN

Copper

AHMEEK (Ahmeek)—Maintaining production at 4700 tons daily.

OSCEOLA (Osceola)—Tonnages from Kearsarges increasing; recently output was better than 80 cars daily, grade of ore being slightly above average.

SOUTH LAKE (Houghton)—Rock now running about 18 lb. to the ton; Butler lode being stoped from three places shows nugget copper in considerable amount.

PHOENIX (Phoenix)—Work suspended few weeks ago; reported to be only temporary shutdown; pumps being removed would seem to indicate permanent abandonment.

WINONA (Winona)—Tributors getting out 420 tons daily, mostly from King Phillip No. 1, but also from Nos. 3 and 4 Winona proper. Mill handling 150 tons daily from South Lake.

MOHAWK (Mohawk)—Increase of output due to more men; handling 70 cars of ore daily, being an increase from 63 recently. Wolverine, the other producing Stanton property, running 40 cars daily.

MICHIGAN (Rockland)—Test run on 1000-ton lot of stockpile showed 20 lb. per ton, not counting mass copper; expected remainder of run will show just as good results. Underground openings in four places show good formation.

ISLE ROYALE (Houghton)—Production increasing; three-head mill on south side of Portage Lake, running at full capacity during week and part time on Sunday. Ore handled at Point Mills plant increased from 12 to 20 carloads daily.

QUINCY (Hancock)—Producing considerable mass copper, being sent direct to smeltery; special methods being required to handle this material, including block and tackle at shaft house; eight-ton chunks not unusual; mass ore opened at 6500-ft. depth.

SUPERIOR (Houghton)—Present output is 450 to 500 tons monthly and at this rate ore in sight is less than one and a half year's supply; recent explorations in West vein on 31st level not good in results; other exploration work will be done. Is one of Calumet & Hecla's subsidiaries.

FRANKLIN (Demmon)—Continues to handle 1000 tons daily; nearly entire output subject to long haul by electric or compressed-air power; necessary to use efficiency to operate on lean ore at present market price; reported to be doing better than making expenses. Sinking to 18th level on No. 2. Best ore coming from Pewabic lode to the north, where good oreshoot being opened.

Iron

CLEVELAND-CLIFFS IRON CO. (Ishpeming)—Operating diamond drills between Ishpeming and Negaunee to trace drift-covered iron formation, now inaccurately mapped.

STEPHENSON (Gwinn)—Inrush of water, which completely stopped all operations, now entering Austin mine through connected workings and threatens shutdown of this mine also. Pumping at Stevenson, suspended as hopeless, resumed to assist Austin property. Cleveland-Cliffs Iron Co. operators of both properties making strenuous efforts to control flood.

MINNESOTA

Cuyuna Range

ALGOMA MANGANESE CO. (Ironton)—Corporation, with capital stock of $500,000, will be dissolved if a petition filed is granted; was organized Nov. 14, 1916. In October, 1917, business ceased and company amalgamated with Onahman Iron Co., the purchase price being $530,000, and indebtedness assumed of $6649.

Mesabi Range

CROSBY (Nashwauk)—Underground property operated by Cleveland Cliffs company worked at capacity during season.

MACE NO. 2 (Nashwauk)—Openpit property, owned by Longyear-Bennett interests, operated under contract by Butler Bros. Expected to show shipments of 275,000 tons. Ore has to be screened because of seams of rock present, so a small screening plant was erected. Portion of ore washed at Harrison washing plant.

MISSOURI

Joplin District

PLEASANT VALLEY (Carthage)—Building small mill; has been good producer most of year operating with nine hand jigs for ore cleaning. Operations at 100 ft. To increase output.

CALITAN (Joplin)—Have 14-in. Pomona and two 5-in. American centrifugal pumps at old Calitan mine east of city. Ground drained and operations started.

A. B. C. (Joplin)—Taken over by G. G. Bayless, Carterville, and Philip Gray, Webb City. Drained and will be started when weather moderates.

U. S. SMELTING (Baxter, Kan.)—New 600-ton mill on Naylor land, west of Baxter, in operation. Uses flotation plant, with Dorr thickeners and classifier for slimes. Operations at 200 ft.

BUNKER HILL (Baxter, Kan.)—Planning erection of two mills on tract southwest of city. Seven holes showed good ore, coming in at about 155 ft. Owned by Tulsa, Okla., men. Charles Clark, Baxter, Kan., superintendent.

MONTANA

Lewis and Clark County

KATIE MINE (Helena)—One carload silver-lead ore to smeltery.

BALD MOUNTAIN TUNNEL (Rimini)—Tunnel in 100 ft. in gold-bearing porphyry.

STEMWINDER (Helena)—One carload to smeltery; drifting on lead.

ST. LOUIS CO. (Marysville)—Eighty tons monthly put through cyanide plant.

CRUSE DEVELOPMENT CO. (Helena)—Stoping and shipping from 500-ft. level.

STANTON MINE (Rimini)—Regular shipments silver-lead ore to smeltery from tunnel in Red Mountain.

SCRATCH GRAVEL GOLD (Helena)—Three carloads a month from 300-ft. level to smeltery. Gold and silver.

HELENA MINE (Helena)—Thirty-five carloads silver-lead ore to smeltery. Operated by Helena Mining Bureau.

GOULD PLACER (Rimini)—Blind lead of high-grade silver ore uncovered in ditch digging. Buildings up and shaft down below 50 ft.

Phillips County

AUGUST MINING CO. (Landusky)—Owing to refusal for an increase of 50c. per day, employees quit, causing shutdown for indefinite time.

Silver Bow County

ANACONDA (Butte)—October record shows 26 accidents in mines, an average of 1.145 for each 10,000 shifts. In 12 of the mines, no accidents of any kind occurred.

NEVADA

Clark County

COPPERSIDE (Goodsprings)—Adjoins the Red Streak property opened similar vein of copper ore and shipped several carloads. Renaux & Schwartz, owners.

PRAIRIE FLOWER (Goodsprings)—Lead-zinc-silver ore recently encountered on north end of 200-ft. level: stoping. James Ashbaugh, manager.

SULTAN (Goodsprings)—Lead-silver orebody of milling grade discovered on 200-ft. level. Mill which has been operating steadily, now closed down for repairs. Henry Robbins, owner and manager.

RED STREAK (Goodsprings)—Operated by Red Streak Copper Mining Co., recently incorporated. During last two months leasers shipped 10 carloads, averaging high-grade copper ore, which occurs as chalcocite in 3-ft. fissure vein in limestone.

BOSS (Goodsprings)—New plant erected in Los Angeles in operation by Palau Metals Co. for treatment of platinum ore from this property. Ore averages 4% copper; 3 oz. silver, 0.8 oz. gold and 1 oz. of platinum and palladium per ton. Using lixiviation process for extraction of precious metals; recovery said to be 90%. Shipping about 300 tons per month; to be increased later. H. K. Riddall, manager.

Nye County

TONOPAH ORE PRODUCTION for week ended Dec. 22 amounted to 10,364 tons, valued at $181,370, comparing with 7655 tons the previous week. Producers were: Tonopah Belmont, 2646 tons; Tonopah Mining, 2850 tons: Tonopah Extension, 2380 tons; Jim Butler, 672 tons; West End, 1159 tons; MacNamara, 496 tons; Montana, 54 tons; Rescue, 67 tons; miscellaneous, 40 tons.

WHITE CAPS EXTENSION MINING (Manhattan)—Buckets used for hoisting muck in shaft sinking replaced by cage with automatic safety devices; first rounds fired in east drift from level showed extremely hard formation, but expects to strike softer rock in short distance.

WHITE CAPS (Manhattan)—Announces 87% extraction with capacity of 150 tons per day in roaster and mill. Slimes amount to 25%, although changes installed are for a maximum of 40% slimes. Partial cleanup of gold precipitates under way; understood cleanup at present is satisfactory.

UTAH

Juab County

TINTIC DELAWARE (Eureka)—New ore reported in two places.

TINTIC STANDARD (Eureka)—Recent strike on 1300-ft. level growing in extent. Orebody opened 42 ft. in length and 35 ft. in width.

IMPERIAL LEAD (Tintic Junction)—Using truck and trailer for hauling ore accumulated during fall awaiting better market. Property in West Tintic.

DESERET MOUNTAIN (Tintic Junction)—Good tonnage copper ore indicated; continuing development with working forces lessened by draft and enlistment.

EAGLE & BLUE BELL (Eureka)—Struck lead ore of good grade on 1875-ft. level, the lowest at present worked, although ground opened to depth of 2000 ft. Good reserves of ore available.

RIDGE AND VALLEY (Eureka)—Pumping equipment for unwatering this and adjoining Gemini being installed. Sinking to be started shortly in Ridge & Valley, to open two properties at depth.

GRAND CENTRAL (Mammoth)—Not shipping at capacity owing to embargo, car shortage, etc. However, first six months of year show 233 cars marketed; 10 months, 379 cars, estimated at 15,000 tons. October showed 32 cars; September, 36 cars; August, 43 cars, and July, 35.

Salt Lake County

MONTANA-BINGHAM (Bingham)—Ore carrying native copper struck in tunnel in fissure—about 5000 ft. from portal, 700 or 800 ft. underground vertically, and about 2200 ft. on dip of formation. Drifted along this fissure for 75 ft. to south of tunnel and 25 ft. to north, where copper continues throughout vein matter. These workings 1400 ft. below deepest old workings. Most of ore at present coming from Fortuna workings. Mill treating 100 tons daily, working two shifts. Heads sample 2 to 2.50% copper. Some ore of shipping grade—5 to 6% copper—being marketed.

COLUMBUS-REXALL (Alta)—Between Dec. 6 and Dec. 15 teams hauled 39 loads of ore, aggregating 175 tons. Lot 26 recently sent to smeltery carried 12 oz. silver and 8.65% copper. In August, September, October and November, a total of 2518 tons of ore shipped, ranging from $22 to $41 a ton. Production valued at upward of $60,000. Some richer ore than usual found along footwall runs well in copper. Capitalized at 600,000 shares, 13,764 remaining in treasury. Lawrence Green, president; M. R. Evans, vice president and general manager.

Utah County

FISSURES EXPLORATION (American Fork)—Working Pacific mine; at present handling 150 tons of ore daily. Expected to increase to 200 tons when more men secured. Pacific fissure producing this ore averages about 8 ft. between walls, and is opened 700 ft. on strike. Higher grade streaks occur in mill ore. Fissure opened to depth of 300 feet.

CANADA

Ontario

OPHIR (Cobalt)—Discovery of 13-in. vein, carrying good-grade silver ore reported.

MILLER LAKE-O'BRIEN (Gowganda)—During November shipped approximately 61,960 lb. of ore.

CASTLE (Gowganda)—Exploration work will be undertaken early this year; plant equipment now en route.

McINTYRE (South Porcupine)—Jupiter shaft down 1000 ft.; lateral work will be started. Producing about $150,000 a month.

KIRKLAND LAKE GOLD (Kirkland Lake)—Expected to close Dec. 30 on account of inability of Beaver to finance it without assistance.

WRIGHT-HARGRAVES (Kirkland Lake)—Installation of new machinery, comprising 200-hp. motor and 12-drill compressor, completed.

DAVIDSON (South Porcupine)—Installing five-stamp mill, which will be running early in this year. Considerable tonnage of ore above 100-ft. level that should show profit.

PORCUPINE CROWN (Timmins)—Continuation of main orebody encountered in crosscutting at 1000-ft. level, where vein compares favorably with previous levels.

WEST DOME (South Porcupine)—Arranged to treat 1000 tons of ore in Dome Lake mill. Ore expected to run $18. Mine being examined by M. Summerhayes, manager of Porcupine Crown.

GIFFORD-COBALT (Cobalt)—Three new calcite veins, one to 3 in. wide, with cobalt and galena encountered in crosscut at 350-ft. level; 10-in. vein previously cut at this level is being driven on and shows low silver content.

ANKERITE (South Porcupine)—Bought Montgomery property adjoining. Main working shaft down 100 ft.; will be continued to 500 ft. Longyears have contract for shaft sinking.

DOME MINES (South Porcupine)—Recent rise in stock has started rumors that mill will be started in spring; unlikely, as nearly all of staff have been let go this month and operations being confined to underground development. Main shaft to be sunk to 1500 ft.

ECUADOR

SOUTH AMERICAN DEVELOPMENT (Guayaquil)—Bullion robbery late in 1917 reported in Peruvian papers was much exaggerated. Fortunately some company officials happened to be at the coast and immediately undertook apprehension of robbers. Bullion recovered in three days.

BELGIAN CONGO

UNION MINIERE DU HAUT KATANGA (Elisabethville)—Produced during first 10 months, 1917, 23,000 tons of copper, comparing with 22,150 tons during year of 1916. Five furnaces have been erected and No. 6 is due to start in operation shortly and installation of No. 7 is nearly completed; entire capacity of seven furnaces when running at full capacity will be about 40,000 tons per annum.

RUSSIA

IRTYSH (Ridder via Ust Kamenogorsk, Government of Omsk)—At annual meeting in London it was stated Ridder mine, which had been flooded, will not be unwatered until labor and other conditions are improved; mechanical equipment on ground and unwatering can be done in six weeks. At Sokolni, important new bodies sulphide ore proved, carrying fair contents in lead and zinc and low content of silver and gold, which new orebodies have increased ore reserves by 360,000 tons, exclusive of extension in depth; also opened belt of oxidized gold ore, 200 ft. wide, averaging nearly 30 dwt. gold. Sokolni ore proved as profitable as Ridder and sufficient in sight to cover mill and smeltery requirements for long time to come. Geological survey made by company's geologists shows five mineralized belts containing outcrops similar to Ridder but greater in extent, the sixth belt contains gold-bearing gossans which proved in other instances to be capping of copper deposits. Ridder railway to Ust Kamenogorsk, 70 miles in length, now in operation; Ekibastous railway extended to total length of 90 miles. Two furnaces in operation at zinc plant and additional furnaces being constructed. Output of spelter for first six months of 1917 was 333 tons, comparing with 210 tons during entire year of 1916. Lead smeltery has been placed in operation.

The Market Report

SILVER AND STERLING EXCHANGE

Dec.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Dec. Jan.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
27	4.7515	86⅜	43⅜	31	4.7515	86⅛	43⅛
28	4.7515	86⅛	43⅛	1	.....	.....	.....
29	4.7515	86⅛	43⅛	2	4.7515	86⅛	43⅛

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Dec. Jan.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
27	*23½	†84	6⅜ @6½	6.30 @6.40	7.60 @7.65
28	*23½	†82	6⅜ @6⅜	6.35 @6.40	7.60 @7.65
29	*23½	†82	6⅜ @6⅜	6.35 @6.40	7.60 @7.65
31	*23½	†82	6⅜ @6⅜	6.35 @6.40	7.60 @7.65
1	....	...	.....	.....	.....
2	*23½	†75	6⅜ @6⅜	6.35 @6.40	7.60 @7.65

† Nominal.

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17.5c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

Jan. Dec.	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
27	110	110	125	302½	295	30½	54
28	110	110	125	294	288	30½	54
29							
31	110	110	125	280	277	30½	54
1							
2	110	110	125	269	263½	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515. £30½ = 6.4696c.; £54 = 11.4545c.; £120 = 25.4544c.; £137 = 29.0605c.; £240 = 50.9089c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—Jan. 2, 1918

The chief feature of interest in the metal markets this week was the slump in the price for tin. The volume of business in both lead and zinc was small.

Copper—Both the American and the foreign governments called for a good deal of copper, as also did domestic manufacturers, especially wire drawers, who are working more or less directly for Government purposes. There was a little buying for February and March delivery.

The chief feature of interest this week was the growing appreciation of how transportation difficulties and coal shortage may diminish the production of the refineries. Important plants have already lost time owing to lack of coal and it is anticipated that they may suffer from the non-delivery of raw material.

Copper Sheets are quoted at 31½c. per lb., f.o.b. mill, for hot rolled, and 1c. higher for cold rolled. Copper wire is quoted at 26@27c. f.o.b. mill, carload lots.

Tin—On Dec. 27 a 5-ton lot was sold at 84c. In following days the market declined sharply, although quotations continued to be nominal, reflecting the sense of the market rather than actual transactions. The decline was in sympathy with the sharp fall in prices in London. At the end of December the stock of tin in this country was only 497 tons, which is believed to be the lowest on record. On Nov. 30 the stock was 1592 tons.

Lead—This market continued dull, but in the latter part of the week there were distinct evidences of more inquiry. The market is becoming difficult to quote, for the freight congestion is preventing the free movement of lead, and high prices are paid locally for lead on the spot or what can be supplied from near-by refineries. Such prices reflect the urgency of the needs of a few buyers, who have run out of stock, and the advantageous position of a few sellers, rather than the broad market, the local transactions at a premium being small in the aggregate. However, there is a distinctly firmer tone in the lead market, and the probability that the appearance of only moderate buying orders will advance the price. Several of important producers are in a sold-out position insofar as January production is concerned.

Zinc—This market was very dull and stationary as to price. The sale of some round lots for export was the most interesting feature.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, less 8% discount.

Other Metals

Aluminum—This market continues comparatively inactive at 37@38c. per lb. for No. 1 ingots at New York, though some advances are being asked for spot delivery owing to railroad congestion.

Antimony—Dull and weaker. We quote spot at 14½c., and futures at 13½c., c.i.f., in bond.

Bismuth—Unchanged at $3.50 per pound.

Cadmium—This metal is quoted at $1.50 @2.00 per lb., depending on the quantity.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electolytic.

Quicksilver—Quicksilver to arrive is quoted at $115, but owing to the scarcity of stocks, spot is realizing fancy prices, as much as $125@135 being reported paid for small lots until the railroad deliveries relieve the scarcity in spot. San Francisco reports, by telegraph, $112.50, steady.

Gold, Silver and Platinum

Silver—During the holiday week silver remained steady to firm, with limited transactions. The United States Government was at times in the market, but so far as can be ascertained, no mutual understanding has yet been reached with the British authorities in regard to taking over the silver-bullion product of this country and redistributing same according to the requirements of the two nations.

Mexican dollars at New York: Dec. 27, 68½c.; 28, 68½c.; 29, 69c.; 31, 69½c.; Jan. 1. . . . ; Jan. 2, 70c.

Platinum—Unchanged at $105 per oz.

Palladium—Strong at $135, with a ready market for all that can be offered.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 29—Blende, per ton, high $72.65; basis 60% Zn, premium $70; medium to low, $60@50; calamine, per ton, 40% Zn, $38@35; average selling price, all grades of zinc, $57.60 per ton.

Lead, high $77.30; basis 80% Pb, $75; average selling price, all grades of lead, $73.84 per ton.

Shipments the week: Blende, 6740; calamine, 320; lead, 1058 tons. Value, all ores the week, $484,710.

Shipment the year: Blende, 444,363, calamine, 37,765; lead, 73,371 tons. Value, all ores the year, $40,892,010.

Shipments of larger quantities of high-grade blende ore advanced the average price of the week, in the face of a declining market. Calamine shipment, on the contrary, was of low grade.

No one believes Government direction of the railroads will make the local situation worse, and generally hopes for a betterment of the car shortage are held.

Low price for zinc ore at Joplin during the week ended Dec. 1, 1917, should have been published as $52.50; in the "Journal" of Dec. 8, 1917, p. 1021, the price for medium- to low-grade ore was erroneously reported as $65@62.50. It should have been $65@52.50.

Platteville, Wis., Dec. 29—Blende, basis 60% Zn, $60 base for premium ore down to $52 base for second grade. Lead ore, basis 80% Pb, $76 per ton. Shipments reported for the week are 3690 tons of zinc ore, 15 tons of lead ore, and 466 tons of sulphur ore. The year's figures compared with those of 1916 are as follows:

	Zinc Ore Gross from mines Tons	Zinc Ore Net to smelteries Tons	Lead Ore Tons	Sulphur Ore Tons
1917	247,993	148,766	7134	28,481
1916	219,118	133,035	4590	32,425
Increase	28,875	15,731	2544	.....
Decrease	.....	.....	....	3944

Shipped during the week to separating plants, 2994 tons of zinc ore.

Premium grade blende at Platteville, Wis., for the week ended Dec. 15, should have been quoted in the "Journal" of Dec. 22 as "unchanged at $62 base," and not $75 base as reported. The market report for the week ended Dec. 15 should have read: "Blende, basis 60% Zn, unchanged at $62 base for premium grade down to $57 base for second grade."

Other Ores

Manganese Ore—Metallurgical ore is unchanged at $1.20 per unit, for 48% grade, delivered to buyers.

Molybdenum Ore—Business was done at $2.25@2.30 per lb. of molybdenum sulphide, basis 90%.

Pyrites—Spanish lump is quoted at 15½c. per unit, on basis of 10s. ocean freight, buyer to pay excess freight and war risk, except that concession of 2% of war risk is allowed. Ocean rates remain at 35s. for Northern, 40s. for Southern and 42s. 6d. for Gulf ports, but recent charters have exceeded these rates in several instances.

Tungsten Ore—This market is quiet, with scheelite at $26 and high-grade wolframite at $24@24.50 per unit. Lower grades are not moving rapidly.

Iron Trade Review

NEW YORK—Jan. 2, 1918

Manufacturing consumers end the year as a rule with fair stocks of material. In many general lines activity has tapered off says "Iron Age," and with Government price control there has not been the incentive to seek maximum protection through contracts. Now that Washington stipulates that price revision on deliveries after Mar. 31 will be in order, the average buyer may show more interest.

The prospect of orders for 100,000 cars that comes with Government control of railroads is not unwelcome to equipment

companies, but with the steel trade the practical question is what tonnage of plates can be spared for car building. The shipbuilding program will absorb more steel later in the year, but new plate capacity is nearing completion and shipyards are not yet organized to take the present platemill output in full.

PITTSBURGH—Dec. 31

By formal announcement of the President, Dec. 28, the set prices for iron and steel are to continue to Mar. 31. The prices set by the War Industries Board after agreement with the manufacturers were announced Sept. 24, Oct. 11 and Nov. 5, while since then the American Iron and Steel Institute has made various recommendations as to prices. The trade hardly expected any revision would be undertaken at this time, but is relieved that the matter is settled for a time. Probabilities are that before Apr. 1 the Washington authorities will consider the price matter more seriously.

The great majority of the producing trade would be well satisfied to have present prices continued indefinitely, and as higher priced contracts are gradually worked out many would be resigned to some reductions. Some reported complaints are misleading. Thus publicity has been given to the complaint of an Eastern plate mill that it cannot afford to sell plates at 3.25c. and will close when its present orders are executed, but the seriousness of its complaints is tempered by the fact that the closing is not to occur until the middle of 1918, while there is the important market fact that at least half a dozen plate mills are seeking orders with attractive specifications at the set price of 3.25c.

There is no improvement in traffic conditions and operations of blast furnaces depending on Connellsville coke continue at about 80% for the merchant furnaces and 70 to 75% for the steel-works furnaces, while several important steel mills are operating far below capacity by reason of insufficient coal deliveries. Both coke operators and coal producers insist they could make much larger shipments, and would do so at the set prices, if they were furnished more cars. Improvement through Government control of the railroads is expected, but only gradually. The usual comment in trade circles is that the chief function of the Government operation now being established will be to annul the laws that have prevented full utilization of the physical facilities of the railroads, all the way from the anti-pooling laws to the full crew and 16-hour laws.

Ordinary commercial buying of steel has been practically nil for several weeks and no early improvement is expected. While shipments to ordinary consumers have been restricted by priorities given to Government orders and by the curtailment in production, steel consumers are as a rule making no serious complaints, and if larger shipments were offered there might be some requests for curtailment. The mills are nursing the contracts they have at prices above those set, as some of these contracts would be difficult of enforcement, delays in delivery having already occurred.

Pig Iron—The market has continued absolutely stagnant, the furnaces having nothing to offer for delivery in the next few months, on account of their restricted output. Some of the steel works would buy basic or bessemer if offered, but they are not as keen as they were three or four weeks ago. We quote the market at the set prices: Bessemer, $36.30; basic and No. 2 foundry, $33; malleable, $33.50; forge, $32, f.o.b. furnace, freight from the valleys to Pittsburgh being 95c.

Ferroalloys

Ferromanganese—The market continues quiet and rather easy, with $245 the common quotation for prompt or contract.

Coke

Connellsville — Car supplies are only a shade better this week and blast-furnace operations are restricted substantially as much as formerly. There is much complaint of the poor quality of coke being shipped, operators attributing this to the fact that they must keep their ovens nominally in blast or be assigned still fewer cars, this resulting in coke being held too long and being overburned. Contracts expired at the year-end are believed to exceed slightly in tonnage the new contracts coming into operation. These contracts were made before the price was set, Sept. 24, and are estimated to average a shade over $8. The market remains quotable at the set prices: Furnace, $6; 72-hour selected foundry, $7; crushed, over 1 in., $7.30, per net ton at ovens.

STOCK QUOTATIONS

N. Y. EXCH.†	Dec. 31
Alaska Gold M.	1⅛
Alaska Juneau	2⅛
Am.Sm.& Ref.,com.	78⅛
Am. Sm. & Ref., pf.	101⅛
Am. Sm. Sec., pf., A	90⅛
Am. Sm. Sec., pf. B.	‡96
Am. Zinc	14
Am. Zinc, pf.	41
Anaconda	61¼
Batopilas Min.	1
Bethlehem Steel	74⅛
Bethlehem Steel, pf.	90
Butte & Superior	16⅛
Cerro de Pasco	31
Chile Cop.	17
Chino	42⅛
Colo.Fuel & Iron	36⅛
Crucible Steel	53⅛
Dome Mines	33⅛
Federal M. & S.	11
Federal M. & S., pf.	35⅛
Great Nor., ore ctf.	27
Greene Cananea	38
Gulf States Steel	90
Homestake	‡90
Inspiration Con.	47
International Nickel	30⅛
Kennecott	32⅛
Lackawanna Steel	77
Miami Copper	29⅛
Nat'l Lead, com.	44⅛
National Lead, pf.	98⅛
Nev. Consol.	18⅛
Ontario Min.	5
Quicksilver	‡.50
Quic silver, pf.	‡⅞
Ray Con	23⅛
Republic I.&S.,com.	79⅛
Republic I. & S., pf.	92⅛
Sloss-Sheffield	40
Tennessee C. & C.	12⅛
U. S. Steel, com.	90⅛
U. S. Steel, pf.	108
Utah Copper	81⅛
Va. Iron C. & C.	50

N. Y. CURB†	Dec. 31
Big Ledge	1⅛
Butte & N. Y.	.75
Butte C. & Z.	7
Butte Detroit	.25
Caledonia	.46
Calumet & Jerome	1⅛
Can. Cop. Corpn.	1 1/16
Carlisle	2
Cashboy	.04⅛
Con. Ariz. Sm.	1⅛
Con. Coppermines	6⅛
Con. Nev.-Utah	‡⅛
Emma Con.	1/16
First Nat. Cop.	2
Goldfield Con.	.34⅛
Goldfield Merger	.03⅛
Greenmonster	⅛
Hecla Min.	4⅛
Howe Sound	3⅛
Jerome Verde	⅛
Kerr Lake	4⅛
L. Q'sland	.50
Magma	.42
Majestic	.29
McKinley-Dar-Sa.	.55
Milford	1⅛
Mohican	⅛
Mother Lode	.26
N. Y. & Hond.	10
Nipissing Mines	8⅛
Nixon Nevada	1
Ohio Cop.	⅛
Ray Hercules	3⅛
Richmond	‡.56
Rochester Mines	.31
St. Joseph Lead	14⅛
Standard S. L.	⅛
Stewart	.22
Success	.09
Tonopah	3⅛
Tonopah Ex.	1⅛
Tribullion	⅛
Troy Arizona	.15
United Cop.	⅛
United Verde Ext.	38⅛
United Zinc	1⅛
Utica Mines	.11
Yukon Gold	1⅛

SAN FRAN.*	Dec. 28
Alta	‡.03
Andes	‡.07
Best & Belcher	‡.02
Bullion	‡.01
Caledonia	‡.05
Challenge Con.	‡.04
Confidence	‡.06
Con. Virginia	.12
Gould & Curry	‡.01
Hale & Norcross	‡.02
Jacket-Cr. Pt.	‡.08
Mexican	.08
Occidental	‡.60
Ophir	‡.04
Overman	‡.04
Savage	‡.03
Sierra Nevada	‡.13
Union Con.	.71
Utah Con.	‡.01
Belmont	3.00
Jim Butler	.75
MacNamara	.18
Midway	‡.05
Mont.-Tonopah	‡.10
North Star	.05
Rescue Eula	.07
West End Con.	.68
Atlanta	.08
Booth	.03
Comb. Frac.	.02
D'field Daisy	‡.02
Florence	.10
Jumbo Extension	.14
Kewanas	.05
Nevada Hills	.05
Nevada Packard	‡.15
Round Mountain	.20
Silver Pick	.04
White Caps	.46⅛
Big Jim	‡.75
United Eastern	3.75

BOSTON EXCH.*	Dec. 31
Adventure	1⅛
Ahmeek	79⅛
Algomah	.30
Allouez	50
Ariz. Com., ctfs.	11⅛
Arnold	‡.20
Bonanza	.21
Butte-Balaklava	.26
Calumet & Ariz.	64⅛
Calumet & Hecla	425
Centennial	13
Copper Range	46
Daly West	1⅛
Davis-Daly	5
East Butte	9⅛
Franklin	4⅛
Granby	76
Hancock	9⅛
Hedley	15
Helvetia	.25
Indiana	.60
Isle Royale	25⅛
Keweenaw	1⅛
Lake	7
La Salle	1⅛
Mason Valley	4⅛
Mass	6⅛
Mayflower	1⅛
Michigan	1⅛
Mohawk	63⅛
New Arcadian	2⅛
New Idria	‡13
North Butte	14⅛
North Lake	.51
Oilbway	.75
Old Dominion	43
Osceola	59⅛
Quincy	69
St. Mary's M. L.	54⅛
Santa Fe	.65
Seneca	6
Shannon	5⅛
Shattuck-Ariz.	16
So. Lake	1⅛
So. Utah	.10
Superior	4⅛
Superior & Bost.	3⅛
Trinity	3⅛
Tuolumne	1
U. S. Smelting	45
U. S. Smelt'g, pf.	44⅛
Utah Apex	2
Utah Con.	11
Utah Metal	2⅛
Victoria	2⅛
Winona	1
Wolverine	34
Wyandot	.50

BOSTON CURB*	Dec. 31
Alaska Mines Corp.	.25
Bingham Mines	9
Boston Ely	.70
Boston & Mont.	.44
Butte & Lon'n Dev.	.10
Calaveras	1
Calumet-Corbin	‡.01
Chief Con.	1⅛
Cortez	.05
Crown Reserve	.20
Crystal Cop.	.47
Eagle & Blue Bell	2
Gila Copper	‡17
Houghton Copper	.50
Intermountain	‡.70
Iron Cap, Com.	14
Iron Cap Cop., pf.	‡14⅛
Mexican Metals	.26
Mines of America	1⅛
Mojave Tungsten	.16
Nat. Zinc & Lead	.25
Nevada-Douglas	1
New Baltic	.75
New Cornelia	15⅛
Oneco	.25
Pacific Mines	‡.35
Rex Cons.	.10

SALT LAKE*	Dec. 28
Bannack	‡.26
Big Four	‡.01
Cardiff	2.50
Colorado Mining	.10
Daly	‡1.00
Daly-Judge	6.50
Empire Copper	‡1.17
Gold Chain	.09
Grand Central	.54
Iron Blossom	.57
Lower Mammoth	‡.03
May Day	.01
Moscow	‡.11
Prince Con.	.62
Rico Wellington	.17
Silver-King Coal'n.	2.45
Silver King Con.	2.93
Sioux Con.	.02
So. Hecla	.70
Tintic Standard	‡1.45
Uncle Sam	.01
Wilbert	.18
Yankee	.16

TORONTO*	Dec. 28
Adanac	.11
Bailey	.05
Beaver Con.	.24
Chambers Ferland	.09
Coniagas	3.15
Hargraves	.10
La Rose	.25
Peterson Lake	.11
Temiskaming	.28
Wettlaufer-Lor.	.04
Davidson	.28
Dome Exten.	.10
Dome Lake	.13
Hollinger	4.90
McIntyre	1.40
Newray	.44
Porcu. Crown	.23
Teck-Hughes	.26
Vipond	.17
West Dome	.12

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Dec. 3
Cresson Con.	4.50
Doctor Jack Pot.	.03⅛
Elkton Con.	.05⅞
El Paso	.15
Gold Sovereign	.02⅛
Golden Cycle	1.43
Granite	.45
Isabella	.08⅛
Mary McKinney	.34
Portland	1.10
United Gold M.	.15⅛
Vindicator	.34⅛

LONDON	Dec. 16		
Alaska Tre'dwell	‡£1	0s	0d
Burma Corp.	4	0	0
Cam & Motor	0	10	6
Camp Bird	0	7	0
El Oro	0	8	3
Esperanza	0	7	9
Mexican Mines	5	18	9
Min. Corp. Can.	0	16	0
Nechi, pfd.	0	9	9
Oroville	0	18	6
Santa Cert'dis.	0	18	6
Tomboy	1	1	0

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
Jan.	48.855	56.775	75.630	22.731	26.960	36.682
Feb.	48.477	56.755	77.585	22.753	26.975	37.742
Mar.	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.065
July	47.519	62.940	79.010	22.597	30.000	40.110
Aug.	47.163	66.083	85.407	22.780	31.498	43.418
Sept.	48.680	68.515	100.740	23.591	32.584	50.920
Oct.	49.385	67.855	87.332	23.925	32.361	44.324
Nov.	51.714	71.604	85.891	25.094	34.192	43.584
Dec.	54.971	75.765	85.960	26.373	36.410	43.052
Year	49.684	65.661	81.417	23.675	31.315	40.851

New York quotations cents per ounce troy, fine silver. London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan.	24.008	28.673	88.083	131.921	116.167	142.895
Feb.	26.440	31.750	102.667	137.895	133.167	148.000
Mar.	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	26.620	95.119	128.409	125.500	140.409
Aug.	26.120	25.380	110.283	122.391	126.304	137.000
Sept.	26.855	25.073	113.905	117.500	134.071	135.250
Oct.	27.193	23.500	122.750	110.000	142.523	125.000
Nov.	30.625	23.500	134.659	110.000	155.432	125.000
Dec.	31.890	23.500	145.316	110.000	162.842	125.000
Year	27.202	27.180	116.059	124.892	138.281	138.401

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	62.570	168.357	242.181
August	38.565	62.681	169.870	243.078
September	38.830	61.542	171.345	244.038
October	41.241	61.851	179.307	247.467
November	44.109	74.740	186.932	274.943
December	42.635	87.120	183.368	298.556
Av. year	43.480	61.802	182.096	237.563

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.123	31.011	30.500
July	6.352	10.710	6.185	10.644	28.137	30.500
August	6.244	10.594	6.088	10.518	29.734	30.500
September	6.810	8.680	6.699	8.611	30.786	30.500
October	7.000	6.710	6.898	6.650	30.716	30.500
November	7.042	6.249	6.945	6.187	30.500	30.500
December	7.513	6.375	7.405	6.312	30.500	30.500
Year	6.858	8.787	6.777	8.721	31.359	30.500

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan.	16.915	9.619	16.745	9.449	89.810	48.329
Feb.	18.420	10.045	18.260	9.875	97.762	47.000
Mar.	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	8.443	8.755	8.473	50.750	54.000
Aug.	8.730	8.360	8.560	8.190	51.587	54.000
Sept.	8.990	8.136	8.820	7.966	52.095	54.000
Oct.	9.829	7.983	9.659	7.813	54.159	54.000
Nov.	11.592	7.847	11.422	7.672	56.023	54.000
Dec.	10.665	7.685	10.495	7.510	55.842	54.000
Year	12.804	8.901	12.634	8.730	72.071	52.413

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	$35.95	$18.78	$30.95	$19.70	$30.95
February	21.16	36.37	18.93	30.95	19.51	30.95
March	21.81	37.37	19.20	33.49	19.45	35.91
April	21.65	42.23	18.95	38.90	19.45	40.06
May	21.78	46.94	19.11	42.84	19.58	43.60
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95	57.45	18.95	53.80	19.20	53.95
August	21.95	54.17	18.95	50.37	19.22	53.95
September	22.88	46.40	19.58	42.24	19.53	48.58
October	24.61	37.25	21.26	33.95	21.51	33.95
November	30.07	37.25	28.18	33.95	26.55	33.95
December	35.16	37.25	30.95	33.95	30.79	33.95
Year	$23.88	$43.57	$20.98	$39.62	$21.15	$40.83

‡ As reported by W. P. Snyder & Co.

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LEAD AND ZINC

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8508—FLOTATION—The Effect of Addition Agents in Flotation. M. H. Thornberry and H. T. Mann. (Met. and Chem. Eng., Dec. 15, 1917; 4¼ pp., illus.) 40c.

8509—LEACHING and Purification of Zinc Sulphate. K. B. Thomas. (Min. and Sci. Press, Nov. 17, 1917; ¾ p.) 20c.

8510—METALLURGY—Losses in Zinc Metallurgy. (Eng. and Min. Journ., Dec. 1, 1917; 1¼ pp.) 20c.

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OTHER METALS

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8523—MANGANESE Fluxing Ore at Pioche, Nev. (Eng. and Min. Journ., Oct. 27, 1917; ¾ p.) 20c.

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8532 — TUNGSTEN — Flow Sheet of Round Valley Tungsten Mill. (Eng. and Min. Journ., Nov. 24, 1917; ⅓ p., illus.) 20c.

8533—TUNGSTEN Mining in Eastern Nevada. (Eng. and Min. Journ., Oct. 27, 1917; ⅓ p.) 20c.

8534—TUNGSTEN—The Kanbauk Wolfram Mine, Lower Burma. Harry D. Griffiths. (Min. Mag., Nov., 1917; 8½ pp., illus.) 40c.

8535—TUNGSTENITE, a New Mineral. R. C. Wells and B. S. Butler. (U. S. Geol. Surv., reprinted from Journ. of Wash. Academy of Sciences, Dec. 4, 1917; 4 pp.) 20c.

NONMETALLIC MINERALS

8536—CHROMITE in 1916. J. S. Diller. (Mineral Resources of the U. S., 1916—Part I, Oct. 26, 1917; 16½ pp., illus.) 20c.

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8561—LATERITE, Its Origin, Structure and Minerals, Chapter IX. J. Morrow Campbell. (Min. Mag., Nov., 1917; 5½ pp.) Continuation of article previously indexed.

8562—MISSOURI-KANSAS—Geological Atlas of the United States, Leavenworth-Smithville Folio, Missouri-Kansas. Henry Hinds and F. C. Greene. (U. S. Geol. Surv., 1917; 18 pp., illus.)

8563—NEW MEXICO—Geological Atlas of the United States Deming Folio, New Mexico. N. H. Darton. (U. S. Geol. Surv., 1917; 20 pp., illus.)

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MINING—GENERAL

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SAMPLING AND ASSAYING.

8598 — FERROSILICON — Analysis of Ferrosilicon. (Iron Age, Dec. 6, 1917; 1 p.) 20c.

8599—LABORATORY—Racks for "Slop Copper" Flasks. H. D. Hunt. (Eng. and Min. Journ., Nov. 17, 1917; ¾ p., illus.) 20c.

FUELS

8600—BYPRODUCT COKE PLANT of Brier Hill Steel Co. F. T. Moran. (Coal Age, Nov. 3, 1917; 2 pp., illus.)

8601—BELGIUM—Belgian Coal and Coke Industry in the War. (Eng. and Min. Journ., Nov. 17, 1917; 2¼ pp.) 20c.

8602 — COAL—Absorption of Methane and Other Gases by Coal. S. H. Katz. (U. S. Bureau of Mines, 1917; 22 pp. illus.)

8603—PEAT in 1916. James S. Turp. (Mineral Resources of the U. S., 1916—Part II, Nov. 19, 1917; 3 pp.) 20c.

8604—PULVERIZED COAL — Methods for More Efficiently Utilizing Our Fuel Resources; Part VII, General Utilization of Pulverized Coal. H. G. Barnhurst. (Gen. Elec. Rev., Dec., 1917; 7½ pp., illus.)

8605 — PULVERIZED COAL — Methods for More Efficiently Utilizing Our Fuel Resources, Part IV. Pulverized Fuel in a Power Plant on the Missouri, Kansas and Texas Railway. H. R. Collins and Joseph Harrington. (Gen. Elec. Rev., Oct., 1917; 10 pp., illus.) Continuation of articles previously indexed.

MINING AND METALLURGICAL MACHINERY

8606—BLUEPRINT MACHINE. (Eng. and Min. Journ., Nov. 24, 1917; ½ p., illus.) 20c.

8607—FUSION APPARATUS — Some Notes on Fusion Apparatus. Frederick Pope. (Met. and Chem. Eng., Dec. 15, 1917; 4½ pp., illus.) 40c.

8608—LAMPS—Approved Electric Lamps for Miners. H. H. Clark and L. C. Ilsley. (Bull. 131, U. S. Bureau of Mines, 1917; 59 pp., illus.)

8609—PRIME MOVERS—Working Costs of the Principal Prime Movers. Oswald Wans. (Iron and Coal Tr. Rev., Oct. 26, 1917; 1⅜ pp., illus.)

8610—WELDING—Thermit Welding and Oxy-Acetylene Welding; Their Respective Fields and Applications. J. H. Deppeler. (Reactions, 1917; 5 pp., illus.)

INDUSTRIAL CHEMISTRY

8611—BENZOL RECOVERY — Laboratory Methods for Benzol-Recovery Plant Operation. F. W. Sperr, Jr. (Met. and Chem. Eng., Nov. 1, 1917; 7 pp., illus.)

8612—COAL PRODUCTS—The Mineral Industries of the United States; An Object Lesson in Resource Administration. Chester G. Gilbert. (Bull. 102, Part I, U. S. National Museum, 1917; 16 pp., illus.) 20c.

8613—CANADA—Shawinigan and Its Electrochemical Industries. H. E. Randall. (Advance copy, Am. Electrochem. Soc., Oct., 1917; 24 pp., illus.) 20c.

8614—NITROGEN—How Do the Warring Nations Obtain Their Nitrogen Supply? S. Nauchkoff. (Met. and Chem. Eng., Nov. 1, 1917; 12 pp., illus.) Paper presented before the Swedish Technological Society, Feb. 8, 1917.

MISCELLANEOUS

8615 — EDUCATIONAL REFORM — Its Relation to a Solution of the Industrial Deadlock. C. V. Corless. (Bull. 68, Can. Min. Inst., Dec., 1917; 8 pp.) 20c.

8616—HYDRATED LIME and Its Qualifications as a Structural Material. Bela Nagy. (Proc. Eng. Soc. W. Penn., Oct., 1917; 32 pp., illus.) 50c.

8617—LABOR — Industrial Democracy Established by Colorado Fuel and Iron Co. (Eng. and Min. Journ., Oct. 27, 1917; 1 p.) 20c.

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8620 — LABOR-TURNOVER RECORDS and the Labor Problem. Richard B. Gregg. (A. S. M. E., Dec., 1917; 8 pp.) 20c.

8622 — SOUTH AMERICA — Bolivia's Railways, Progress and Prospects. Wm. A. Reid. (Bull. Pan Am. Union, Oct., 1917; 19 pp., illus.)

8623—TRACTOR HAULING in Arizona. H. O. Hogue. (Min. and Oil Bull., Oct., 1917; 3¼ pp., illus.) 20c.

8624—WAR—Military Books for Engineers. (Eng. and Min. Journ., May 12, 1917; 1½ pp.) 20c.

8625—WAR—The Application of Radium in Warfare. Chas. H. Viol and Glenn D. Kammer. (Advance copy, Am. Electrochem. Soc., Oct., 1917; 8 pp.)

8635—WOOD PRESERVATION — Economic Importance of Wood Preservation. Kurt C. Barth. (Eng. and Min. Journ., Dec. 8, 1917; 3¼ pp., illus.) 20c.

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Mill Lots, Pittsburgh	St. Louis	Chicago	San Francisco	New York—Dec. 31, 1917	New York—One Yr. Ago
No. 10	4.25	5.52	5.45	6.25	5.45	4.65
No. 12	4.30	5.57	5.50	6.30	5.50	4.70
No. 14	4.35	5.62	5.55	6.35	5.55	4.75
Black						
Nos. 18 and 20	4.80	6.32	6.25	6.90	6.25	5.30
Nos. 22 and 24	4.85	6.37	6.30	6.95	6.30	5.35
No. 26	4.90	6.42	6.35	7.00	6.44	5.40
No. 28	5.00	6.52	6.45	7.10	6.45	5.50
Galvanized						
No. 10	5.25	6.97	6.80	....	6.70	6.35
No. 12	5.35	6.97	6.80	....	6.80	6.45
No. 14	5.35	6.97	6.80	....	6.80	6.55
Nos. 18 and 20	5.65	7.17	7.10	7.75	7.10	6.90
Nos. 22 and 24	5.80	7.32	7.25	7.90	7.25	7.05
No. 26	5.95	7.02	7.40	8.05	7.40	7.20
No. 28	6.25	7.77	7.70	8.35	7.70	7.50

STEEL RAILS—The following quotations are per ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh—Dec. 31, 1917	Pittsburgh—One Year Ago	Chicago*—Dec. 31, 1917	Chicago*—One Year Ago
Standard bessemer rails	....	$38.00	....	$38.00
Standard openhearth rails	....	40.00	....	40.00
Light rails, 8 to 10 lb.	....	53.00	....	47.00
Light rails, 12 to 14 lb.	....	52.00	....	46.00
Light rails, 25 to 45 lb.	....	50.00	....	44.00

Note—No quotations. Cambria Steel Co. and Carnegie Steel Co. reported to be filled up on rails for a year.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh—Dec. 31, 1917	Pittsburgh—One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, ⅝-in. and larger	$3.90	$3.50	$5.00	$6.45	$7.25
Standard section angle bars	.....	2.50–2.75	4.50	Premium	4.65
Track bolts	4.90	4.85	6.25	Premium	8.80

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill, Pittsburgh	New York—Dec. 31, 1917	New York—1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in.	$3.00	$4.195	$3.95	$4.27	$4.20	$5.00	$5.50
Channels, 3 to 15 in.	3.00	4.195	3.95	4.27	4.20	5.00	5.50
Angles, 3 to 6 in., ¼ in. thick	3.00	4.195	3.95	4.27	4.20	5.00	5.50
Tees, 3 in. and larger	3.00	4.195	3.95	4.27	4.25	5.00	5.50
Plates	3.25	4.445	4.75–5	4.52	4.45	5.25	6.50

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill, Pittsburgh	Warehouse—New York—Dec. 31, 1917	Warehouse—New York—One Year Ago	Warehouse—Chicago	Warehouse—St. Louis	Warehouse—San Francisco	Warehouse—Dallas
¾ in. and larger	$5.25	$7.00	$5.25	$5.50	$5.55	$6.65	$7.50

CONE HEAD BOILER

¾ in. and larger	5.35	7.10	5.35	5.60	5.65	6.75	8.00
⅞ and 1¼	5.50	7.25	5.50	5.75	5.80	6.90	8.15
½ and ⅝	5.85	7.60	5.85	6.10	6.15	7.25	8.50

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill, Pittsburgh	Chicago	St. Louis	Denver	Birmingham
Straight	$4.75	$6.00	$5.50	$7.50	$6.75
Assorted	4.90	6.00–6.50	5.75	7.75	7.00

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b Pittsburgh, with a comparison of a month and a year ago:

Dec. 31, 1917	One Month Ago	One Year Ago
$4.00 to $5.00	$4.00 to $5.00	$3.10

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York	St. Louis
Galvanized iron rigging	List + 20%	+20%
Galvanized cast steel rigging	Net List	List
Bright plow steel	30%	30%
Bright cast steel	17½%	17½%
Bright iron and iron tiller	5%	5%

SWEDISH (NORWAY) IRON—This material per 100 lb. sells as follows:

	Dec. 31, 1917	One Year Ago
New York	$14.00	$6.00
Cleveland	15.00	6.30
Chicago	13.50	5.50

In coils an advance of 50c. usually is charged:
Note—Stock scarce generally.

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Chicago	Birmingham	St. Louis	Denver
$0.12	$0.09	$0.16	$0.15	$0.16

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Chicago
Solid	12c.	14½c.	9c.
Hollow	24c.	23½c.	..

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, basing card of Nov. 6, 1917, for steel pipe and for iron pipe:

BUTT WELD

Steel—Inches	Black	Galvanized	Iron—Inches	Black	Galvanized
⅜, ¼ and ⅝	44%	17%	¾ to 1½	33%	17%
½	48%	33½%			
¾ to 3	51%	37½%			

LAP WELD

2	44%	31½%	2	26%	12%
2½ to 6	47%	34½%	2½ to 4	28%	15%
			4½ to 6	28%	15%

BUTT WELD, EXTRA STRONG PLAIN ENDS

⅜, ¼ and ⅜	40%	22½%	¾ to 1½	33%	18%
½	45%	32½%			
¾ to 1½	49%	36½%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	42%	30½%	2	27%	14%
2½ to 4	45%	33½%	2½ to 4	29%	17%
4½ to 6	44%	32½%	4½ to 6	28%	16%

Note—National Tube Co. quotes on basing card dated Apr. 1.

From warehouses at the places named the following discounts hold for steel pipe:

	Black—New York	Black—Chicago	Black—St. Louis
¾ to 3 in. butt welded	38%	42.8%	40.1%
3½ to 6 in. lap welded	18%	38.8%	36.1%

	Galvanized—New York	Galvanized—Chicago	Galvanized—St. Louis
¾ to 3 in. butt welded	22%	27.8%	25.1%
3½ to 6 in. butt welded	List	18.8%	22.1%

Malleable fittings, Class B and C, from New York stock sell at list price. Cast iron, standard sizes, 15 and 5%.

MISCELLANEOUS

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels:

	New York	Chicago	Denver—In Bbl. Lots	Denver—In Carload Lots
Pure steam-distilled pine oil	$0.50½	$0.45	$0.30	$0.27
Pure destructively distilled pine oil	.40	.43	.30	....
Pine tar oil	.28½	.30	.24½	.19
Crude turpentine	.37	.47	.44	.38
Hardwood creosote	.19½*	.....	.34½	.31

*F.o.b. Cadillac, Mich.

SODIUM CYANIDE—New York price is 37c. per lb.; Denver, 44c.; in Chicago, 50c.; in St. Louis, 45c.

SODIUM SULPHIDE—In New York the price per pound is 4c. to 4¼c. for concentrated, 2¼c. to 2½c. for crystals. The Denver price for concentrated is quoted at 3½c. The Chicago price is 3½c. Concentrated comes in 500-lb. drums, the crystals in 400-lb. barrels.

ZINC DUST—New York price is 18c. per lb. in 1600-lb. barrel; Chicago, 18c.; in Denver, 18c.; in St. Louis, 25c.

ALUMINUM DUST—Chicago price is $1 per lb.

CALCIUM CARBIDE—Price f.o.b. cars at warehouse points east of Mississippi River (except in Alabama, Georgia and Florida) is $97.50 for Cameo, $102.50 for Union miners' carbide. In territory between Mississippi River and the Rockies and in Alabama, Georgia and Florida, add $5; west of Rockies, add $10 to $15.

LINOLEUM—In 50-sq.yd. rolls in carload lots the price is 96¾c. per square yard, for concentrating tables.

HOSE—

Fire

	50-Ft. Lengths
Underwriters' 2½-in.	75c. per ft.
Common, 2½-in.	40%

Air

	First Grade	Second Grade	Third Grade
¾-in., per ft.	$0.60	$0.35	$0.30

Steam—Discounts from list

First grade.... 30% Second grade.... 30% Third grade.... 40%

RUBBER BELTING—The following discounts from list apply to transmission rubber and duck belting:

Competition 50% Best grade 20%
Standard 35%

LEATHER BELTING—Present discounts from list in the following cities are as follows for cut lengths:

	Medium Grade	Heavy Grade
New York	40%	35%
St. Louis	45%	40%
Chicago	30+10%	40+5%
Birmingham	35%	40%
Denver	40%	40%

RAWHIDE LACING—40%.

MANILA ROPE—For rope smaller than ⅛-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅛-in., 8 ft.; ¼-in., 6; ⅜-in., 4½; 1-in., 3½; 1¼-in., 2 ft. 10 in.; 1½-in., 2 ft. 4 in. Following is price per pound for ⅛-in. and larger, in 1200-ft. coils:

Boston	$0.36½	Denver	$0.35½
New York	.35	Kansas City	.33½
Cincinnati	.33	New Orleans	.33
Chicago	.35	Los Angeles	.34
St. Paul	.34	Seattle	.33½
San Francisco	.31		

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$0.77
Asbestos for high-pressure steam	1.54
Duck and rubber for piston packing	.88
Flax, regular	.66
Flax, waterproofed	.99
Compressed asbestos sheet	.99
Wire insertion asbestos sheet	1.21
Rubber sheet	.55
Rubber sheet, wire insertion	.88
Rubber sheet, duck insertion	.44
Rubber sheet, cloth insertion	.25
Asbestos packing, twisted or braided, and graphited, for valve stems and stuffing boxes	1.10
Asbestos wick, ½- and 1-lb. balls	.65 to .70

FIRE BRICK—Quotations on the different kinds in the cities named are as follows, f.o.b. works:

	New York	Chicago
Silica brick, per 1000	$50.00 to 55.00	$55.00 to 60.00
Fire clay brick, per 1000, No. 1	45.00 to 55.00	.....
Magnesite brick, per net ton	135.00 to 145.00	.....
Chrome brick, per net ton	135.00	.....
Deadburned magnesite brick, per net ton	85.00 to 90.00	.....
Special furnace chrome brick, per net ton	60.00 to 70.00	60.00 to 80.00

Standard size fire brick, 9 x 4½ x 2½ in. The second quality is $4 to $5 cheaper per 1000.

St. Louis—High grade, $55 to $65; St. Louis grade, $40 to $50.

Birmingham—Fire clay, $25 to $30; Denver, $23, per 1000.

RAILWAY TIES—For fair-size orders, the following prices per tie hold:

	Material	7 in. x 9 in. by 8 Ft. 6 In.	6 in. x 8 in. by 8 Ft.
New York	Yellow Pine	$1.30	$1.06 to 1.11
St. Louis	No. 1 White Oak	1.00	.75
Chicago	White Oak—Plain	.97	.82
Chicago	White Oak—Creosoted	1.30	1.15
San Francisco	Douglas Fir—Green	1.21	.86
San Francisco	Douglas Fir—Creosoted	2.12	1.52

GREASES—Prices are as follows in the following cities in cents per pound for barrel lots:

	Cincinnati	Chicago	St. Louis	Birmingham	Denver
Cup	7	5¼	5,6	10½	10½
Fiber or sponge	8	6	5.9	15	15
Transmission	7	6	5.9	10	15
Axle	4½	4	3,3	3	5
Gear	4½	4½	6	5½	5½
Car journal	23 (gal.)	3½	3.75	5	5

COTTON WASTE—The following prices are in cents per pound:

	New York		Cleveland	Chicago
	Dec. 31, 1917	One Year Ago		
White	11.00 to 13.00	10.00 to 12.00	16.00	14.00 to 15.00
Colored mixed	8.50 to 12.00	7.00 to 9.00	14.00	10.00 to 12.00

WIPING CLOTHS—In Cleveland the jobbers' price per 1000 is as follows:

13¼ x 13¼ ..... $35.00 13¼ x 20½ $45.00

In Chicago they sell at $30 to $33 per 1000.

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Dec. 31, 1917	One Year Ago	Dec. 31, 1917	One Year Ago	Dec. 31, 1917	One Year Ago
Raw in barrels	$1.28	$0.96	$1.25	$1.00	$1.26	$1.03
5-gal. cans	1.38	1.00	1.40	1.10	1.36	1.13

WHITE AND RED LEAD in 500-lb. lots sell as follows in cents per pound:

	Red				White	
	Dec. 31, 1917		1 Year Ago		Dec. 31, 1917	1 Yr. Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
25- and 50-lb. kegs	11.50	11.00	10.50	11.00	10.50	10.50
12½-lb. keg	11.75	11.25	10.75	11.25	10.75	10.75
100-lb. keg	11.25	11.50	11.00	11.50	11.00	11.00
1- to 5-lb. cans	13.25	13.00	12.50	12.50	13.00	12.50

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Dec. 31, 1917	One Year Ago	Dec. 31, 1917	One Year Ago	Dec. 31, 1917	One Year Ago
Hot pressed square	$1.00	$0.50	$1.40	$3.00	$2.00	$3.00
Hot pressed hexagon	1.00	.50	1.20	3.00	2.00	3.00
Cold punched square	1.00	....	.75	2.00	1.50	2.50
Cold punched hexagon	1.00	.50	.75	2.75	1.50	3.00

Semifinished nuts sell at the following discounts from list price:

	Dec. 31, 1917	One Year Ago
New York	40%	40%
Cleveland	50—10%	65—10%
Chicago	50%	65—10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
⅜ by 4 in. and smaller	30%	50%	40—10%
Larger and longer up to 1 in. by 30 in.	15%	40%	30—5%

WROUGHT WASHERS—From warehouses at the places named the following amount is deducted from list price:

New York ..... $1.00 Cleveland ..... $3.50 Chicago $3.00

For cast-iron washers the base price per 100 lb. is as follows:

New York ..... $5.00 Cleveland ..... $4.50 Chicago $3.50

EXPLOSIVES—Price per pound in small lots at cities named:

	Low Freezing	Gelatin			Black
	20%	40%	60%	80%	Powder
New York	.....	$0.27½	$0.34½	.....	$2.50*
Boston	.....	.....	.36¼	$0.43¾	....
Cincinnati	$0.21¾	.23¾	.28¾	.....	....
Kansas City	.20	.26¼	.33¼	.43¼	....
New Orleans	.....	.27½	.29¼	.....	....
Seattle	.18½	.24¾	.31¾	.41¾	....
Chicago	.19¾	.23¾	.33	.43	2.55*
St. Paul	.20	.26¼	.33¼	.....	2.55*
St. Louis	.16½	.20½	.29½	.39½	2.15*
Denver	.19	.25¼	.32¼	.42¼	....
Los Angeles	.24	.30	.39	.....	....
San Francisco	.17¼	.23½	.30½	.40½	....

*Keg.

FUEL OIL—Price variable, depending upon stock. New York quotations not available owing to this fact. In Chicago and St. Louis the following prices are quoted:

	Chicago	St. Louis
Mexican heavy, 12-14 Baumé	7c.	none
Domestic light, 22-26 Baumé	5½c.	7½c.

Note—There is practically no fuel oil in Chicago at present time.

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f.o.b. New York or Chicago:

	Carload Lots	Less Than Carload Lots
Tar felt (14 lb. per square of 100 sq.ft.)	$61.00	$62.00
Tar pitch (in 400-lb. bbl.)	15.00	16.50
Asphalt pitch (in barrels)	29.00	30.50
Asphalt felt	60.00	62.00

PREPARED ROOFINGS—Standard grade rubbered surface complete with nails and cement costs per square as follows in New York and Chicago:

	1-Ply		2-Ply		3-Ply	
	c.l.	l.c.l.	c.l.	l.c.l.	c.l.	l.c.l.
No. 1 grade	$1.15	$1.40	$1.45	$1.60	$1.75	$1.90
No. 2 grade	1.10	1.25	1.25	1.40	1.50	1.65

Asbestos asphalt saturated felt (14 lb. per square) costs $5.35 per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $1.85 per roll in carload lots and $2.10 for smaller quantities.

Shingles, red and green slate finish, cost $4.75 per square in carloads, $5 in smaller quantities, in Philadelphia.

HOLLOW TILE—

	4x12x12	8x12x12	12x12x12
Boston	$0.08	$0.15	$0.20
St. Paul	.055	.138	.153
Denver	.11	.20	.30
Los Angeles	.0668	.12	.20
Seattle	.06	.10	.16

LUMBER—Price per M in carload lots:

	8 x 8-in. x 20 Ft. and Under				12 x 12-In., 20 Ft. and Under	
	Y.P.	Fir	Hemlock	Spruce	Y.P.	Fir
Boston	$52.50	$52.50	....	$40.00	$60.00	$60.00
Cincinnati	35.00	....	....	....	35.50	....
Kansas City	42.00	34.00	....	....	48.00	35.00
Seattle	27.00	27.00	$27.00	27.00	27.00	27.00
New Orleans	28.00	....	....	....	38.00	....
St. Paul	....	38.00	38.00	38.00	....	51.00
Denver	....	34.00	....	30.00	....	36.00

	1-In. Rough, 10 In. x 16 Ft. and Under			2-In. T. and G. 10 In. x 16 Ft.	
	Y.P.	Fir	Hemlock	Y.P.	Fir
Boston	$45.00	....	....	$50.00	$50.00
Cincinnati	35.00	....	....	37.50	....
Kansas City	43.00	$50.00	$50.00	51.00	55.00
Seattle	....	27.00	27.00	27.00	27.00
New Orleans	36.00	....	....	28.00	....
St. Paul	....	53.00	34.00	61.00	37.50
Denver	....	30.00	30.00	....	32.00

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags:

	Dec. 31, 1917	One Month Ago	One Year Ago
New York	$2.22	$2.22	$1.72
Jersey City	2.16	2.16	1.60
Boston	2.77	2.77	1.92
Chicago	2.21	2.31	1.86
Pittsburgh	2.31	2.31	1.81
Cleveland	2.44	2.44	1.94
Denver	3.10	3.20	...
Los Angeles	2.40	2.40	...

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finished	Common	Finished	Common
New York	$16.50	$13.25	$2.10	$1.90
Kansas City	20.00	17.50	1.85	1.75
Chicago	15.00	12.00	1.90	1.60
St. Louis	13.00	....	....	1.50
Boston	16.50	14.50	2.75	2.40
San Francisco	17.00	....	....	1.65
St. Paul	17.00	12.50	1.20*	1.00*
New Orleans	....	....	....	1.40
Birmingham	15.00	....	1.50†	....

*Per 180-lb. barrel. †Birmingham, 200-lb. barrels.

Denver—There is one classification of hydrated lime, quoted at $21.25 per ton, paper bags. Lump lime sells for 65c. per bushel of 80 lb., in bulk or barrel weights.

Note—Refund of 10c. per bag, amounting to $2 per ton.